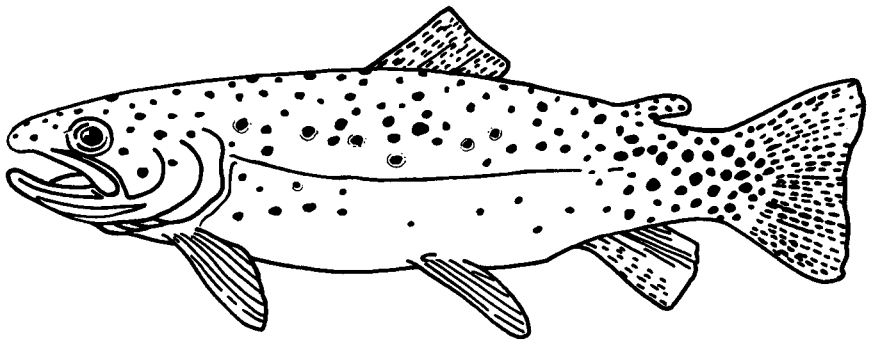
65% Draft Construction Plans and Technical Specifications for Spokane Ditch Siphon Project

Wisdom, Montana



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Montana Fish, Wildlife & Parks

TECHINCAL SPECIFICATIONS AND DRAWINGS
SPOKANE DITCH SIPHON FISHERIES PROJECT

These technical specifications address all anticipated construction and excavation activities to be completed during the Spokane Siphon installation.

INDEX TO TECHNICAL SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2 - SITEWORK

DIVISION 3 - CONCRETE

DIVISION 5 - METALS

SECTION 01000
SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Related Documents
B. Summary Scope of Work

1.02 RELATED DOCUMENTS

A. Sheets and Figures included in Appendix A

Section	Sheet	Title
1	1-1	Title Sheet
1	1-2	Sheet Index
1	1-3	Site Plan
2	2-1	Siphon Plan-Profile
2	2-2	Siphon Details
2	2-3	Siphon Details
3	3-1	Swamp Creek Diversion Plan-Profile
3	3-2	Swamp Creek Diversion Details
4	4-1	Backfill Plan
4	4-2	Backfill Details

1.03 SUMMARY SCOPE OF WORK

The scope of work addressed by these plans and specifications consists of a siphon installation on Spokane irrigation canal with an overflow structure and a check-diversion structure with a fishway in Swamp Creek and a headgate structure and diversion channel to Spokane canal.

The Contractor or Contractors shall perform the following work per these specifications:

A. Install one 63” HDPE Siphon with overflow structure and channel with associated erosion protection per the plans and these specificatons.
B. Install a check-diversion structure with a fishway and headgate structure on Swamp Creek.

END OF SECTION 01000

SECTION 01010
GENERAL PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. PROGRESS SCHEDULES

B. TEMPORARY FACILITIES AND SITE CONTROL

C. CONSTRUCTION SURVEYING

D. SUBMITTALS

E. TRAFFIC CONTROL AND SITE SAFETY

F. EROSION AND SEDIMENT CONTROL

G. CONSTRUCTION SEQUENCING AND OTHER CONTRACTORS

H. EXISTING STRUCTURES

I. RECORD KEEPING REQUIREMENTS

1.01 PROGRESS SCHEDULES

Contractor shall prepare an initial project schedule and shall update and maintain the schedule appropriately. Copies of all initial schedules and updates shall be provided to the ENGINEER upon request.

1.02 TEMPORARY FACILITIES AND SITE CONTROL

Contractor shall notify and coordinate with all appropriate utility companies and ENGINEER before conducting work proximate to overhead or buried utilities.

1.03 CONSTRUCTION SURVEYING

Contractor shall provide all construction surveying needed to complete the work.

1.04 SUBMITTALS

Contractor shall provide product information and submittals for the following items:

1. Re-bar;
2. Concrete mix;
3. BMP Plan;
4. Stream Diversion Plan;
5. Fish Ladder Shop Drawing
6. Geosynthetic Material
7. HDPE Pipe Material
8. Fill Materials
9. Trash Rack at Siphon Inlet and;
10. Other items as required by Engineer.

1.05 TRAFFIC CONTROL AND SITE SAFETY

Traffic control and site safety shall be the sole responsibility of Contractor. Adequate signs, barricades, cones, drums, barriers, lighting, flagmen, security guards, and other methods or devices shall be utilized.

1.06 EROSION AND SEDIMENT CONTROL

A. Temporary diversions for storm runoff or Swamp Creek flows shall be conducted as specified in Section 02270 and as needed to direct flows around the work area. These diversions shall be designed, implemented and maintained by the Contractor in accordance with Best Management Practices (BMPs) to control erosion and sediment release into Spokane Creek. BMPs may include, but are not limited to, temporary berms, cofferdams, sediment basins, ditches, silt fencing, straw bales, straw mulch, and erosion control matting.

B. The Contractor shall plan and execute work to control and minimize surface runoff from cuts, fills, and other disturbed areas. The Contractor shall prevent sediment and/or sediment-laden water from entering Swamp Creek to the extent practicable.

C. Dewatering: All dewatering flows collected from open sumps, trenches or excavations shall be routed through sediment retention structure prior to discharge to Swamp Creek. The Contractor shall comply with the dewatering requirements of Section 02140. All storm runoff flows from work areas also shall be routed through sediment retention structure prior to discharge.

D. Swamp Creek Reconstruction

Best Management Practices (BMPs) measures shall be installed along Swamp Creek and Spokane irrigation canal prior to any earthwork which could release sediment to Swamp Creek. BMPs shall remain in place until vegetation is established, as approved by ENGINEER. The methods

implemented by the Contractor will be monitored by ENGINEER to assure compliance with BMPs.

1.07 CONSTRUCTION SEQUENCING AND OTHER CONTRACTORS

Contractor shall coordinate his construction activities with those of any and all other contractors that may be working on the site or adjacent sites. Contractor's work shall be conducted in a manner that will not impede the progress of other concurrent construction activities.

1.08 EXISTING STRUCTURES

A. The Contractor shall notify and coordinate with all appropriate utility companies and with ENGINEER to field-locate overhead or buried utilities, wells, and other existing structures prior to construction. Location, depth, size, and material of existing buried utilities within excavation limits shall be verified prior to beginning construction.

C. The Contractor shall be responsible for protecting existing structures within and external to the construction area not specified for demolition. Any damage to existing structures, whether above or below ground level, shall be repaired to the owner's satisfaction by the Contractor at no additional cost to FWP. The existing wood structures in the Spokane canal and Swamp Creek shall be removed, and disposed of as approved by ENGINEER.

D. Adjacent properties may have cattle or bison on them while the project is underway. Gates will need to be kept closed and fencing will need to remain intact or temporary fencing maintained to control livestock. **In no case is an opening to be left in the fencing overnight**.

1.09 SITE ACCESS

A. Site access is via Gibbonsville Road, approximately 4 miles west of Wisdom.

B. Access Contact: James Magee, Fish Wildlife Service, Phone (406)683-3893

END OF SECTION 01010

SECTION 02110
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of surface debris.

B. Clearing and grubbing of all vegetation including trees, shrubs, and grass.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PROTECTION

A. Locate, identify, and protect existing utilities from damage.

B. Protect benchmarks and existing structures from damage or displacement.

3.02 CLEARING

A. Clear all surface debris and vegetation, including the root zone, from all areas impacted by the Work and as required for access to site and execution of Work as shown on the Drawings, and as directed by ENGINEER

B. Remove identified trees, shrubs, stumps, roots, brush, rubbish, and other objectionable material within work areas and from the surfaces of all borrow areas and stockpile sites.

C. Existing wood diversion structure(s) to be removed.

3.03 REMOVAL

A. Removed trees with diameters greater than 2-inches shall be cut into 6-foot lengths and stockpiled on site as directed by ENGINEER. Smaller woody material shall be chipped and disposed of as directed in paragraph B.

B. Remove debris, rock, and extracted vegetation and dispose of materials by spreading debris in adjacent area as directed by ENGINEER.

END OF SECTION 02110

SECTION 02140
CONSTRUCTION DEWATERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section specifies dewatering requirements and procedures necessary during installation and use of dewatering pumps and appurtenances, groundwater collection trenches/sumps, and dewatering wells and/or wellpoints.

1.02 RELATED SECTIONS

Section 02200 - Unclassified Excavation
Section 02220 - Trench Excavation and Backfill

1.03 SUBMITTALS

A. The Contractor shall submit a Construction Dewatering Plan to ENGINEER prior to executing the work. The Construction Dewatering Plan shall be a written procedure for implementing the construction dewatering requirements specified herein. The plan shall describe the layout, materials, and equipment, and the operation and maintenance procedures proposed.

1.04 DESCRIPTION OF SITE CONDITIONS

A. The site condition description provided herein is based on surface observations.

1. General: Within the project area, Swamp Creek flows in a north easterly direction within a wide flat valley. The left and right banks of the channel have access to the flood plain. Spokane Canal intercepts Swamp Creek. The Swamp Creek channel bed in the area of the proposed structure appears to be silt-loam with gravels. The canal is active during irrigation season, but Swamp Creek has continual flows and will need to be rerouted around the construction site. There are 2 wooden structures at the intersection of Swamp Creek and Spokane Canal that will be removed as part of the construction activities.

2. Groundwater: Groundwater is evident at the site area. It is anticipated that the collection of and pumping of ground water will be necessary during construction.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. The Contractor shall provide, and maintain on site, all equipment, piping, fittings, and appurtenances necessary to collect, pump, and convey discharge water to adequately dewater all open excavations, including spare fittings, pumps and other materials necessary to maintain a continuously operating dewatering system.

B. The Contractor shall provide and maintain primary and backup power supplies and power distribution systems as necessary to operate the dewatering system without significant interruption. All grounding shall be provided per the NEC. The power plants and their appurtenances shall be protected from weather and other potentially detrimental conditions at the site (e.g., dust, impacts, etc.)

C. The Contractor shall provide all necessary equipment and materials to collect and pump dewatering flows.

PART 3 EXECUTION

3.01 DEWATERING

A. The Contractor shall fully implement all measures and precautions necessary to ensure the safety of workers, and the protection of the Work (including maintenance of integrity against rupture and/or heave of the bottom of the excavation) during excavation and dewatering, including, but not limited to, full implementation of the requirements of this Section 02140.

B. The Contractor shall provide backup and spare equipment (as specified in Part 2.01), immediately available for installation and/or operation to minimize any interruption in the required pumping. In the event of pump failure for reasons beyond the Contractor's ability to control, all excavation shall cease, and the Contractor shall implement repairs and resume pumping as soon as possible.

C. Maintain excavation dewatering sufficiently to allow for visual inspection, quality assurance, and as-built surveying, to be conducted by ENGINEER at their discretion.

END OF SECTION 02140

SECTION 02200
UNCLASSIFIED EXCAVATION

PART 1 GENERAL

SECTION INCLUDES

A. Work under this Section includes unclassified excavation associated with the installation of the Spokane siphon and Swamp Creek structures.

1.02 RELATED SECTIONS

Section 02110 - Clearing and Grubbing
Section 02140 - Construction Dewatering
Section 02210 - Fill Materials and Placement

1.03 REGULATORY REQUIREMENTS

A. Sheeting, Shoring, and Bracing: Except where trench banks are cut back on a stable slope, provide and maintain all sheeting, shoring, and bracing necessary to protect workers, and to protect adjoining grades and structures from caving, sliding, erosion or other damage in accordance with Occupational Safety and Health Standards (29 CFR Part 1926 - Construction Standards for Excavations), the Site Specific Health and Safety Plan, and other applicable codes and governing authorities.

1.04 FIELD MEASUREMENTS

A. Verify that survey coordinates and elevations indicated on the Drawings are accurate as indicated. Notify ENGINEER of any discrepancies prior to construction.

PART 2 PRODUCTS (Not used)

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Accurately locate, identify, and protect from damage all utilities, benchmarks, monitoring wells and other structures not designated for demolition. The Contractor is responsible for verifying that all utilities

through the work area have been accurately located prior to excavation, and that no conflicts exist.

C. If temporary diversions for storm runoff or base flows are deemed necessary by the Contractor, they shall be designed, implemented and maintained by the Contractor as specified in Section 01010, Part 1.06.

3.02 EXCAVATION

A. Excavation shall conform to the boundaries, elevations, and excavation slopes shown on the Drawings. Limits of excavation shall be the minimum required to complete the Work.

B. Remove loose material, lumped subsoil, boulders, and loose rock from excavations leaving excavation surface exposed and clean.

C. Graded areas shall be sloped to promote surface drainage and discourage ponding.

D. Stockpile excavated materials suitable for backfill along the excavation at a safe distance in accordance with Occupational Safety and Health Regulations, in areas not susceptible to erosion and other applicable codes and governing authorities. Excavated materials not suitable for backfilling shall be wasted on site as directed by ENGINEER. Wasted material shall be revegetated in accordance with Section 02910.

3.03 PROTECTION

A. Protect excavations as required to prevent cave-in or loose soil from falling into excavation.

3.04 TOLERANCES

A. Excavate to within ± 0.2 feet of elevation and location as shown on the Drawings.

B. Maintain excavation dewatering sufficiently to allow for visual inspection and as-built surveying, to be conducted by ENGINEER at their discretion.

C. Any areas of over-excavation shall be filled with Type A Fill or Type B Fill, as directed by ENGINEER and at no additional cost to FWP.

3.05 FIELD QUALITY CONTROL

A. Provide for access, visual inspection, and construction surveying of excavation surfaces as required by ENGINEER.

END OF SECTION 02200

SECTION 02210
FILL MATERIALS AND PLACEMENT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

This section specifies fill materials, borrow areas/sources of fill materials, and fill placement requirements for the following:

1. General Site Backfill;

1.02 RELATED SECTIONS

Section 03300 – Cast In Place Concrete
Section 02270 – Stream Channels and Diversions

1.03 SUBMITTALS

Submit data sheets and test results from compliance testing of materials provided by Contractor to ENGINEER for review and approval.

1.04 REFERENCES

A. Sampling and Preparation

1. ASTM D75 - Standard Practice for Sampling Aggregates.

2. ASTM D420 - Recommended Practice for Investigating and Sampling Soil and Rock.

B. Classification

1. ASTM D421 - Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.

2. ASTM D422 - Standard Method for Particle-Size Analysis of Soils.

3. ASTM D2487 - Classification of Soils for Engineering Purposes.

4. ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit,

and Plasticity Index of Soils.

C. Density and Moisture Content: Field

1. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

2. ASTM D2922 - Test Methods for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth).

3. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

D. Density and Moisture Content: Laboratory

1. ASTM D698 or AASHTO T99 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

2. ASTM D1557 or AASHTO T180 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

3. ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.

4. ASTM D4253 - Maximum Index Density of Soils Using a Vibratory Table.

5. ASTM D4254 - Minimum Index Density of Soils and Calculation of Relative Density.

6. ASTM D4643 - Determination of Water (Moisture) Content of Soil, Microwave Oven Method.

7. ASTM D4718 - Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. Type A Fill: General fill free of debris, deleterious or objectionable materials, and rocks larger than 6-inches. Type A Fill shall be a compactable, well-graded, granular material approved by Engineer. Type A fill may be used for temporary roads, berms, cofferdams or dikes, or other temporary structures built for construction purposes and as granular backfill material to be used to backfill the retaining walls.

B. Type B Fill: Granular bedding material conforming to the following gradation criteria unless otherwise approved by the Engineer, to be used under the apron and other bedding as shown on the Drawings.

Particle Size	% Finer Than
1-inch	100
3/4-inch	85-100
3/8-inch	30-60
#4 sieve	0-10

C. Type C Fill: Clean, naturally occurring backfill for excavated areas and for construction of berms or other structural fill features. Type C Fill shall conform to the following gradation criteria and have a Plasticity Index less than 10, or otherwise approved by the Engineer:

Particle Size	% Finer Than
6-inch	90-100
#200 sieve	0.5-20

D. Growth Media: Growth Media is defined as topsoil (A horizon material) and subsoil (B horizon material). Unless otherwise directed by the Engineer, growth media shall be stripped from all proposed disturbed areas within the project limits to a depth of 1 foot measured from the top of ground surface following clearing and grubbing. Stripped cover soil shall be stockpiled on site in an area where it will not interfere with construction activities and is not susceptible to erosion. The cover soil stockpile shall be of such uniformity and dimensions it can be conveniently measured by cross-section.

2.02 SOURCE QUALITY CONTROL

A. Contractor shall submit 1 particle size analysis per 1000 cy for imported soil products. Tests and analyses of soil materials will be performed in accordance with applicable ASTM test methods, as listed under Part 1.04.

B. If tests indicate materials do not meet specified requirements, change material and retest at no cost to FWP

PART 3 EXECUTION

3.01 SOURCE OF MATERIALS

A. Contractor shall be responsible for locating suitable sources of Type A, B and C Fill.

B. Growth Media shall be salvaged on sight as specified in Part 2.01 D.

3.02 PREPARATION FOR PLACEMENT

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect utilities that remain from damage, including all monitoring wells. Notify utility companies for utilities which may be affected by the work, or which cross the work area.

D. Protect bench marks and existing structures from excavating equipment and vehicular traffic.

E. Compact subgrade or existing underlying fill to a minimum depth of 12 inches to meet density requirements for subsequent fill materials as specified in Part 3.04.

F. Cut out soft areas of subgrade or existing underlying fill that cannot be compacted as specified in paragraph E, above. Backfill with material type specified for subsequent fill, and compact to minimum density requirements for subsequent fill material as specified in Part 3.04. Over excavation required by Engineer will be paid for under a Change Order.

G. Dewater area as needed prior to fill placement. Fill may not be placed if groundwater is present.

3.03 PLACEMENT

A. General Backfilling of Excavated Areas and Other General Fill

1. Place fill in lifts not to exceed 3 feet in loose thickness. Thinner lifts must be used if required to achieve compaction criteria presented in

Part 3.04 paragraph A, below.

2. Finish grade to within ± 0.2 foot of line and ± 0.1 % of grade shown on the Drawings.

3. Maintain positive surface drainage to minimize ponding of water on fill.

4. Material shall not be frozen when placed. Material shall not be placed on ice. Material shall not be placed on frozen material unless directed by Engineer. Frozen material shall be scarified, disked, or otherwise made suitable to receive subsequent fill and provide an acceptable bond between lifts, as approved by Engineer.

B. Backfilling of Structure, Retaining Wall and Apron Subgrade

1. Place fill in lifts not to exceed 12 inches in loose thickness. Thinner lifts must be used if required to achieve compaction criteria presented in Part 3.04 paragraph B, below.

2. Finish grade to within ± 0.2 feet of line

3. Material shall not be frozen when placed. Material shall not be placed on ice. Material shall not be placed on frozen material unless directed by Engineer. Frozen material shall be scarified, disked, or otherwise made suitable to receive subsequent fill and provide an acceptable bond between lifts, as approved by Engineer.

C. Berm Fill and other Structural Fill

1. All surfaces upon or against which structural fill will be placed, including previously placed and compacted layers, shall be free of all objectionable materials in accordance with Section 02110 - Site Clearing, shall be relatively flat in preparation for subsequent fill placement, shall be moist but free of standing or ponded water, unless otherwise approved by the Engineer, and shall be scarified as necessary so as to provide a suitable bond between the existing and subsequently placed material.

2. Place fill of type designated on Drawings in lifts not to exceed 12 inches in loose thickness.

3. Finish grade to within ± 0.2 foot of line shown on the Drawings for embankment slopes, and within + 0.3 foot on embankment crests.

4. Maintain positive surface drainage to prevent ponding of water on fill.

5. Material shall not be frozen when placed. Material shall not be placed over ice. Material shall not be placed on frozen material unless directed by Engineer. Frozen material shall be thawed, scarified, disked or otherwise made suitable to receive subsequent fill and provide an acceptable bond between lifts, as approved by Engineer.

3.04 COMPACTION

A. General Backfilling of Excavated Areas and Other Non-Structural Fill Density: Materials shall be compacted sufficiently to support traffic by construction equipment, construction surveying, and inspection vehicles.

A. Structural Fill

1. Moisture Content: The moisture content, as determined by ASTM D2216, shall be between $\pm$ 2 % of the optimum moisture content as determined by ASTM D698. The moisture content shall be uniform throughout the lift. Placed materials not meeting this requirement, as determined by testing by Contractor, shall be scarified to a depth of 1 foot, wetted or dried as necessary to meet this requirement, and mixed to uniform water content.
2. Density: Materials shall be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D698.

B. Type A and C material, berm and retaining wall backfill shall be compacted to a firm, unyielding surface as approved by Engineer.

C. Type B Apron Slab Subgrade: Place Type B material by dumping from a height no less than 1 foot and no greater than 5 feet. Spread material evenly with rake or shovel to ensure uniform distribution of material throughout area of backfill. Mechanically tamp a minimum of three passes with the tamper.

3.05 SITE GRADING

Grade all areas including excavated, filled, and transition areas to obtain the finished surface shown on Drawings, to the tolerances specified in Part 3.03 above. Finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. Finished surfaces shall have positive drainage to minimize ponding of water.

3.06 FIELD QUALITY CONTROL

A. Observation of compaction control and gradation will be conducted by Engineer. Compacted fill, not meeting the requirements of these specifications shall be corrected at no additional expense to FWP.

B. Contractor shall perform all initial control and grade staking during construction. Contours and elevations not meeting the requirements of these specifications shall be corrected at the Contractor's expense.

END OF SECTION 2210

SECTION 02220

TRENCH EXCAVATION AND BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

Work under this section includes site preparation, earthwork and surface restoration for underground pipe and appurtenances as shown on the Drawings and specified herein, including the sedimentation pond outlet works.

1.02 RELATED SECTIONS

Section 02210 - Fill Materials and Placement Requirements
Section 02200 - Excavation

1.03 SUBMITTALS

A. Submit the following to Engineer:

B. Certificates of Compliance: Furnish certification that standards specified herein are met.

1.04 REFERENCES

A. Backfilling and Compaction: Reference Standards as listed in Section 02210.

1.05 DEFINITIONS

A. Pipe Bedding Material: Fill placed under, beside and directly over the pipe prior to subsequent backfill operations, as shown on the Plans.

1.06 CLASSIFICATION OF EXCAVATED MATERIALS

A. No classification of excavated materials will be made. Perform excavation of every description and of whatever materials encountered to the depths indicated.

PART 2 PRODUCTS

2.01 BACKFILL MATERIALS

Refer to Pipe Bedding Detail shown on the Drawings.

A. Pipe Bedding Material - Type B Granular Bedding Material, as specified in Section 02210.

B. Type C, Clean Backfill, as specified in Section 02210.

C. Overexcavation - Type C Fill as specified in Section 02210 shall be used as directed by Engineer to replace soft, spongy, or otherwise unsuitable material encountered in the trench bottom.

PART 3 EXECUTION

3.01 PREPARATION

A. Surface Improvements: Protect from damage or restore to their original condition all surface improvements encountered during trenching. Improvements shall include but not be limited to surfacing, utilities, monitoring wells, signs, and fencing.

B. Underground Obstructions:

1. Before commencing work, obtain information concerning location, type, and extent of all existing utilities on the site.

2. Protect from damage any underground pipes, utilities, or structures encountered during construction. Restore any damaged underground obstructions to their original condition.

3. All obstructions exposed during trenching shall be inspected by Engineer prior to backfilling. Contractor shall be responsible for providing adequate notice (minimum of 24 hours) to Engineer for inspections.

C. Sheeting, Shoring, and Bracing: Provide and maintain sheeting, shoring, and bracing as necessary to protect workmen, and adjoining grades and structures from caving, sliding, erosion, or other damage in accordance with Occupational Safety and Health Standards 29 CFR Part 1926 - Construction

Standards for Excavations, the Site Specific Health and Safety Plan, and other applicable codes and governing authorities.

D. The use of explosives will not be permitted.

E. Drainage: Maintain the excavations free from water throughout the work. Remove any water encountered in the trench to provide firm subgrade, to permit joints to be made dry at the final grade, and to prevent entrance of water into the pipeline.

F. Protection: Protect from excavation equipment and vehicular traffic all bench marks, existing structures, monitoring wells, fences, pavements, above and below-grade utilities that are to remain, and other features that are to remain.

G. Field Measurements: Initial survey staking of the location and elevation of the proposed structures shall be provided by Contractor prior to commencing excavation.

H. Construction Staking: The Contractor shall be responsible for all construction staking during construction activities.

3.02 EXCAVATION

A. Trenching: Excavate trenches by open cut. Conform to sheeting, shoring, and bracing requirements of OSHA, and other applicable codes and governing authorities.

B. Stockpiling Excavated Materials: Stockpile Suitable Materials along the trench at a safe distance in accordance with Occupational Safety and Health Administration (OSHA) Regulations, and other applicable codes and governing authorities. Remove excavated materials not suitable or required for backfilling, as directed by Engineer.

C. Excavation to Grade: Accurately grade trench bottoms to provide uniform bearing and support for pipe and pipe bedding material. Remove stones larger than three inches as necessary to avoid point bearing.

D. Unstable Pipe Subgrade: Cut out wet or soft areas encountered in the bottom of the trench which are not capable of in-situ compaction. Backfill to grade with Type C Fill, as directed by Engineer. Compact in accordance with compaction requirements for Structural Fill in Section 02210.

E. Limiting Trench Widths: Conform to the Pipeline Bedding details shown on the Drawings. Cut trenches sufficiently wide to enable installation and allow inspection. Minimum trench width shall be 8 feet.

F. Unauthorized Excavation:

1. If the trench depth is over-excavated, backfill such over-excavation with Type C Fill as directed by Engineer and compact in accordance with compaction requirements for Embankments and Structural Fill in Section 02210.

2. If the maximum trench width is exceeded provide higher strength pipe, as approved by Engineer.

3.03 BEDDING PLACEMENT

A. Refer to bedding details shown on the Drawings.

B. Granular bedding material shall be placed by hand or other careful manner so as not to damage or disturb pipe, in maximum layers of 6-inches loose thickness, and thoroughly compacted by tamping. Special care shall be taken to assure complete compaction under the haunches of the pipe.

C. Bedding shall be compacted in accordance with Section 02210, Part 3.05A.

3.04 TRENCH BACKFILLING AND COMPACTION

A. Place and compact Type B Granular Bedding Material, and Type C Fill in accordance with Drawings and placement and compaction requirements specified in Section 02210, Part 3.05A.

B. Mechanically compact trench backfill by means of tamping rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers as approved by Engineer. Compaction by jetting will not be permitted.

C. Compaction compliance testing will be performed by Contractor in accordance with Section 02210, Part 3.07.

3.05 SURFACE RESTORATION

A. Replace and repair any surface improvements damaged or removed, as directed by Engineer.

B. Reshape and re-compact fills subjected to vehicular traffic during construction as necessary to meet lines, grades and compaction requirements.

END OF SECTION 02220

SECTION 02270
STREAM CHANNELS AND DIVERSIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

This Section includes all grading, excavation, and backfill required for all storm drainage and channel reconstruction needed to complete the Work. This shall include construction of stream channels and diversions; furnishing, hauling and placing riprap material; furnishing, placing and constructing riprap aprons for surface water inlet/outlet structures; and furnishing materials for diversion dams in accordance with the Drawings and these Specifications.

1.02 RELATED SECTIONS

Section 02210 - Fill Materials and Placement Requirements
Section 02220 - Pipe Trenching, Backfilling, and Compacting
Section 02620 - Corrugated Metal Pipes and Outlet Works
Section 02710 - Geosynthetic Materials

1.03 SUBMITTALS

Submit the following to ENGINEER:

A. Materials Source/Product Data: Submit material source and manufacturer specifications on items proposed for use and as specified herein.

B. Laboratory Test Results: Submit data sheets and test results from compliance testing of materials supplied by Contractor to ENGINEER for review and approval.

1.04 REFERENCES

Codes and Standards: Comply with provisions of following, except as otherwise indicated:

A. AASHTO - M147 - Materials for Aggregate and Soil-Aggregate.

B AASHTO T11 and T27 or ASTM C136 - Methods for Sieve Analysis of Fine and Coarse Aggregates

C. ASTM D75 - Standard Practice for Sampling Aggregates.

D. ASTM D422 - Standard Method for Particle-Size Analysis of Soils.

E. For Backfill and Compaction - Reference standards as listed in Section 02210, Part 1.04.

PART 2 PRODUCTS

2.01 DIKE/ROAD MATERIALS

A. Type A Fill: General, clean fill for backfilling of excavated areas, and for construction of dikes, roads or other features which may encroach on the active stream channel or areas of standing water in channel overbank areas, as specified in Section 02210.

2.02 RIPRAP

Riprap shall be installed at the locations and to the dimensions indicated on the Drawings. The stone shall be hard, durable, sub-rounded to angular in shape, resistant to weathering to water and to ice action; free of excess amounts of thin flat, and elongated pieces, free from overburden, spoil, shale, structural defects, and organic material. The smaller stone shall be uniformly distributed throughout the work. The rock shall be manipulated by hand or machine methods sufficiently to secure a uniform surface and mass stability.

A. Type 1 Riprap: Shall be classed as random riprap conforming to the following gradation:

Weight of Stone (lbs)	Equivalent Spherical Diameter (ft)	% of Total Weight Passing
100	1.05	100
60	0.88	70-90
25	0.66	40-60
2	0.20	0-10

2.03 SOURCE QUALITY CONTROL

A. Tests and analysis of soil material will be performed in accordance with applicable ASTM test methods.

B. If tests indicate materials do not meet specified requirements, change material and retest at no cost to FWP.

C. Compliance testing will be performed by ENGINEER at its discretion.

PART 3 EXECUTION

3.01 SOURCE OF MATERIALS

A. Contractor is responsible for locating a source of Type 1 Riprap.

3.02 TEMPORARY STREAM DIVERSIONS OF SWAMP CREEK

A. Prior to beginning any Work which requires stream diversion, Contractor must submit a Stream Diversion Plan for Engineer approval **2-weeks prior to** implementing any diversions of Swamp Creek. Contractor diversion plans are subject to specific review and approval by Engineer.

B. No excavation may be performed within the existing channel of Swamp Creek prior to construction of a suitable diversion of the stream around all work areas.

C. All stream diversions shall have the capacity to convey 30 cfs with a minimum of 1-foot freeboard required for open channels and minimum 1-foot of freeboard required above pipe inlet water surface elevation at the design flow.

D. Appropriate erosion protection must be addressed in the Contractor's Stream Diversion Plan.

3.03 RECONSTRUCTED CHANNEL FOR SWAMP CREEK and SPOKANE CANAL

A. Streambank Erosion protection must be provided in the reconstructed stream channel, and must meet with ENGINEER approval, prior to introducing Swamp Creek flows.

3.04 OTHER STORM FLOW DIVERSIONS

A. Other storm flow diversions may be constructed as needed to trap sediment and direct flows using Best Management Practices (BMPs). BMPs may include, but are not limited to, construction of temporary berms, sediment basins, ditches and channels. Other temporary storm runoff control BMPs may be required to control sediment release into Swamp Creek. Temporary storm runoff control BMPs may include, but are not limited to, silt fencing, straw bales, straw mulch, hydroseeding, and erosion control matting. Such measures must be implemented prior to beginning work in areas, which would be impacted by storm flows.

3.05 EXCAVATION

All excavation for diversions or stream channels shall meet with the specifications of Section 02200.

3.06 DIKE CONSTRUCTION

Construction of all dikes for diversions or stream channels shall meet with the specifications of Section 02210 related to embankments and structural fills.

3.07 RIPRAP

A. Riprap shall be placed in accordance with the details shown in the Drawings.

B. Placement of riprap shall start at the toe of the slope and proceed up the slope. The riprap shall be placed such that damage to the Geotextile layer does not occur. Riprap shall not be dropped onto the Geotextile. Geotextile displaced or otherwise damaged during placement shall be replaced as directed by ENGINEER at the Contractor's expense.

C. Placement of riprap for aprons of inlet/outlet structures shall follow the same installation procedures as previously mentioned. Geotextile shall be placed and anchored in accordance with specifications listed in Section 02710, the manufacturer’s recommendations, and the details shown on the Drawings.

D. The Contractor shall endeavor to place the riprap in such a manner as to minimize the slope roughness and present as smooth a surface to the stream flow as practical.

END OF SECTION 02270

SECTION 02561

PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

Work Included: Work under this section includes furnishing and installing pipe and fittings. Furnish pipe and fittings complete with all jointing materials for the following:

A. Other piping systems as shown on the Drawings.

1.02 RELATED SECTIONS

Section 02220 – Trench Excavation and Backfilling.

1.03 QUALITY ASSURANCE

A. Pipe and Fitting Marking: Mark pipe with the following information applied at intervals of not more than 5 feet:

Nominal size and O.D. base.
Material code designation.
Applicable dimension ratio, pressure class or schedule number.
Applicable standard designation number.
Manufacturer's name or trade mark.

B. Reference Standards: Standards listed hereunder and referenced elsewhere in these specifications shall become a part of this specification and are incorporated herein by reference. This latest edition, amendment or supplement thereto in effect 30 days before date of invitation shall apply.

1. American Water Works Association (AWWA):

Polyethylene (PE) Pressure Pipe and Fittings 4" through 63" for Water Distribution.

2. American Society for Testing and Materials (ASTM):

ASTM D 1248 Standard Specification for Polyethylene Plastics

Molding and Extrusion Materials

ASTM D 3350 Standard Specification for Polyethylene Plastics (PE) Pipe and Fitting Materials

ASTM D 3035 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter

ASTM D 3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

ASTM D 1693 Test Method for Environmental Stress - Cracking of Ethylene Plastics

ASTM D 2837 Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials

ASTM D 2321 Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

ASTM D 790 Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM F 412 Definitions of Terms Relating to Plastic Pipe Systems

ASTM F 585 Practice for Insertion of Flexible Polyethylene Pipe into Existing Sewers

ASTM F 894 Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe

ASTM F 714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

ASTM F 1248 Determination of Environmental Stress Crack Resistance (ESCR) of Polyethylene Pipe

1.04 SUBMITTALS

Submit the following in accordance with Section 01000 - General Requirements:

A. Certificates: Submit manufacturer's certification that materials meet

specification requirements.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect pipe from impact, bending, compression or abrasion during handling and storage.

B. Store pipe on flat surface which provides even support for the pipe barrel. Do not stack pipe higher than 5 feet.

C. Ship rubber gaskets in cartons and store in a clean area away from grease, oil, ozone producing electric motors, heat and the direct rays of the sun.

D. Use nylon sling to handle pipe. The use of hooks or bare cables will not be permitted.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. High Density Polyethylene (HDPE) Pipe

1. Pipe and Fittings (63")
   Conformance: ASTM D3350, DR 32.5
   Joints: ASTM D3261, Heat fusion polyethylene plastic pipe
   Pressure Class: 50 psi
   Acceptable Product: Polypipe EHMW Plus, DR-32.5 HDPE 63' Dia. pipe, as manufactured by Polypipe, Inc. or approved equal.

2. HDPE Wall Anchor
   Conformance: ASTM D3350, DR 32.5
   Joints: ASTM D3261, Heat fusion polyethylene plastic pipe
   Pressure Class: 50 psi
   Acceptable Product: Polypipe EHMS Plus, DR-32.5 HDPE Wall Anchor

2.02 INLETS

A. General

1. Water tight connection on concrete inlet/outlet.

C. Grates

1. Inlet Trash Rack or Engineer approved equivalent.

E. Cast-in Pipe Connection

1. Type A Cast-in Pipe Connection: A-Lok X-Cel watertight compression manhole connector or Engineer approved equivalent.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine the pipe and fittings for cracks, dents, abrasions or other flaws prior to installation. Mark rejected piping with a yellow crayon and remove rejected piping from the project within 24 hours.

3.02 PIPE INSTALLATION

A. Cutting Pipe:

1. Cut pipe square with saws or pipe cutters designed specifically for the material. Protect the pipe and fittings from serrated holding devices and abrasion.

2. Wipe off all dust and dirt from the jointing surfaces and remove cuttings from interior of pipe or tubing.

3. Treat pipe ends in accordance with the manufacturer's recommendations.

B. Jointing the Pipe:

1. Joints in pipe shall be made in accordance with manufacturer's printed instructions and recommendations for specific method used.

2. Joints shall be watertight.

C. Installation of piping:

1. Piping shall be installed in accordance with the manufacturers printed

instructions.

2. Lay and maintain all pipe to the specified lines and grades with fittings, tees and manholes at the specified locations.

3. Where piping bends are identified on Drawings, care shall be exercised to install piping in a manner which properly secures, supports and prepares piping to enable pipe curvature without incurring kinking. Kinked or otherwise damaged pipe shall be removed from the project site.

4. Exercise care to prevent foreign material from entering the pipe as it is installed. When pipe laying is not in progress, close the open ends of pipe using a plug or other means approved by the Engineer. Remove and clean all sand, gravel, concrete and cement grout that has entered the lines during construction.

D. Final Backfill – Placement and Compactions

1. Material shall not be frozen when placed. Material shall not be placed on or against frozen material.

2. Buried Warning Tape: Buried Warning Tape shall be placed directly over the pipe at a distance of 24 to 30 inches above the outside top of pipe. Place Buried Warning Tape over entire pipeline except where finished grade is less than 24 inches above the outside top of pipe.

E. Tolerances:

1. Install pipe within 1-inch of specified grade for pipe larger than 15-inch diameter. These tolerances apply to any point along the entire pipe length.

3.03 INLET INSTALLATION

A. Construction:

1. Construct inlets to the specified dimensions as shown on the drawings.

2. Construct inlet structures to the line, cross-section and dimensions specified.

3. Install cast-in pipe connections according to manufacturer recommendations

END OF SECTION 02561

SECTION 02710
GEOSYNTHETIC MATERIALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

This section includes product specifications for geotextile materials, storage, and handling guidelines, and installation procedures for geotextiles and geomembranes used for the following:

A. Filter fabric and temporary erosion protection.

B. Silt fencing for sediment control.

1.02 RELATED SECTIONS

Section 02210 - Fill Materials and Fill Placement Requirements
Section 02270 – Stream Channels and Diversions

1.03 SUBMITTALS

Submit the following to ENGINEER:

A. Product Data: Submit catalog data or brochures or manufactured items specified herein proposed for use.

B. Certificates of Compliance: Furnish certification that standards specified herein are met.

PART 2 - PRODUCTS

2.01 GEOTEXTILE

A. Type A Geotextile: Type A Geotextile shall be a nonwoven geotextile with a minimum puncture resistance of 110 pounds (ASTM D-4833). Geotextile shall be PROPEX Geotex 801 or an Engineer approved equivalent.

B. Type B Geotextile: Type B Geotextile shall be a non-woven coir fabric made from 100 percent biodegradable coconut fiber strands (coir) formed into a uniform blanket. The blanket is made of mattress coir evenly distributed over the entire area of the blanket. Netting is not required, however 100 percent biodegradable netting may encase the coir strands. Use a blanket of no less than 5 mm in thickness and a minimum weight of 325 grams per square

meter of fabric. Geotextile shall be a BonTerra C2 or an Engineer approved equivalent.

C. Silt fence shall have minimum permittivity of 10 gal/min/ft^2 (ASTM D-4491). The silt fence shall be PROPEX Geotex style 2130 or Engineer approved equivalent.

2.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Packaging: Each roll of geosynthetic material shall be packaged individually in a suitable sheet, wrapper or container to protect the fabric during normal storage and handling, from damage due to ultraviolet light, and moisture.

B. Labeling: Each roll shall be identified by a tag or label securely affixed to the outside of the roll on one end. The label shall include the manufacturer or supplier, the style number and the roll number.

C. Storage: Store all geosynthetic materials elevated off the ground and ensure that they are adequately covered.

D. Geosynthetics damaged during transport, storage or placement shall be replaced at no expense to FWP.

PART 3 - EXECUTION

3.01 SITE PREPARATION

The area to be covered by the geotextile shall be graded to a smooth condition free from protruding objects such as rocks, sticks and other debris. Maximum care must be taken to remove all objects that would damage the geosynthetic.

3.02 INSTALLATION

A. Type A Geotextile

1. The geotextile shall be spread immediately ahead of the covering operation. The geotextile shall be laid smooth and pulled taut without excessive wrinkles. The geotextile shall not be dragged through mud or over sharp objects, which could damage the geotextile.

2. Overlap adjacent panels a minimum of 2 feet or as specified by the manufacturer.

3. Pegs, pins, or the manufacturer's recommended method shall be used as needed to hold the geotextile in place until the specified cover material is placed.

4. Install filter fabric between riprap and subgrade in accordance with the Drawings.

B. Type B Geotextile

1. The geotextile shall be spread immediately ahead of the covering operation. The geotextile shall be laid smooth and pulled taut without excessive wrinkles. The geotextile shall not be dragged through mud or over sharp objects, which could damage the geotextile.

2. Overlap adjacent panels a minimum of 2 feet or as specified by the manufacturer.

3. Provide either "T" shaped hardwood stakes or biodegradable pins for anchoring seams and edges of the coir matting with the following approximate dimensions: leg length: 280 mm, head width: 32 mm, head thickness: 11 mm, leg width: 15 mm (tapered to a point), leg thickness on fabric seams and edges: 11 mm, total length: 305 mm. Provide wood stakes that are solid, that will not split or crack, and are free of rot. Contractor may fabricate stakes or may purchase stakes. Provide 203 mm steel staples for use in stapling interior spaces of fabric segments. One manufacturer of staples and stakes meeting these specifications is North American Green (available from Roscoe Steel).

4. Install the erosion control fabric to the grade and elevation shown on the Plans. Staple (stake) the fabric in place using manufacturer's recommendations for stream bank application or alternative method as approved by Engineer. Space stakes on fabric seams and edges a maximum of 1 foot center to center. Install stakes flush with the fabric surface. Install 8 inch steel staples throughout interior spaces of fabric segments. Space staples throughout fabric segments a maximum of 2 feet center to center. Install fabric so that the upstream segment is overlapping the neighboring downstream segment. Place topsoil and seed below the fabric as shown on plans. Smooth the topsoil to allow the fabric to lay flat. Ensure the fabric has full contact with the soil beneath and no voids exist.

C. Silt Fence

1. Contractor may install silt fence as part of Best Management Practices to be used for erosion/sediment control adjacent to Swamp Creek.

2. Silt Fence shall be installed on the stream side of all improvements as directed by ENGINEER but shall not be installed in direct contact with the stream.

3. Adjacent panels of silt fencing shall be joined in accordance with the recommendations of the manufacturer.

4. At ENGINEER option, samples of the silt fence geotextile shall be submitted for material property confirmation testing.

5. All silt fence geotextile which has defects, deterioration, or damage as determined by ENGINEER may be rejected by ENGINEER and replaced at Contractor's expense.

6. Sediment deposits in excess of ½ the height of the silt fence shall be removed and transported to an ENGINEER designated area.

3.03 REPAIRS AND SPECIAL INSTALLATION

A. Should the geotextile be torn or punctured, the damaged area shall be repaired or replaced to manufacturer's specifications by the contractor at no cost to FWP. The repair shall consist of a patch of the same type material.

B. Geotextile patching shall overlap the existing geotextile a minimum of 3 feet from the edge of any part of the damaged area.

C. For silt fence, a new section of silt fence shall be installed of sufficient length to span, at a minimum, two posts. New section of material shall be joined to existing by sewing.

3.04 CONTROL SAMPLING

For geotextiles, GCL, and silt fence, ENGINEER representative may randomly select and obtain samples from rolls and samples of seams after arrival at the site and prior to installation. The minimum sample size from a roll shall be 1.5 yards by the full roll width.

END OF SECTION 02710

SECTION 02910
SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section includes ground surface preparation, furnishing all seeding, mulch, labor, equipment, and materials to revegetate the areas impacted during construction activities, temporary diversion channels, permanent stream channel alterations, dikes, waste material areas and/or other areas shown on the Drawings and described in the contract documents.

B. Unapproved areas of disturbance which are disturbed by the Contractor's operation will also require seeding and mulching. Any such disturbed areas will be considered as site damage and will not be measured or considered for payment.

1.02 RELATED SECTIONS

Section 02110 – Site Clearing
Section 02200 – Unclassified Excavation
Section 02210 – Fill Materials and Placement Requirements
Section 02270 – Stream Channels and Diversions

1.03 SUBMITTALS

A. Submit the following to ENGINEER: Certificates of Compliance: Furnish certification that standards specified herein are met.

PART 2 PRODUCTS

2.01 SEED MIXTURES

A. Type A seed mix shall conform to the following specifications:

	Grass Species	**% PLS Count**
●	Western Wheatgrass* *(*substitute Thickspike for sandy soils*)	30%
●	Streambank Wheatgrass	20%
●	Hard Fescue* *(*substitute Green Needlegrass for silty and clay soils*)	20%
●	Slender Wheatgrass	15%
●	*Green Needlegrass (wildlife)*	15% to 10%
●	-others-	+/-10%

B. Do not use wet, moldy or otherwise damaged seed in the work.

C. Seed mixture shall be applied at the following PLS rates:

Drilled Rate = 8 lbs./acre
Broadcast Rate = 16 lbs/acre
Hydroseed Rate = 16 lbs/acre

D. COVER SOIL

3. Use salvaged cover soil as specified in Section 02210. Cover soil shall be loose, friable, soil, free of excess acid and alkali. Assure cover soil does not contain objectionable amounts of sod, hard lumps, large rocks, or other undesirable material that would form a poor seedbed.

2.02 MULCHING MATERIAL

A. Mulch shall be vegetative mulch.

B. All mulch shall be "Montana certified weed-seed free mulch".

C. Grass hay or straw mulch is subject to the ENGINEER approval.

PART 3 EXECUTION

3.01 COVER SOIL

A. Place at least 6 – loose inches of cover soil in all areas to be seeded.

3.02 ALLOWABLE SEEDING MONTHS

A. Perform seeding when the temperature and moisture are favorable to germination and plant growth. Seed preferably before June 1 and after October 1 of each year. Seeding dates must be approved by Owner.

3.03 SEEDBED PREPARATION, SOWING AND MULCHING

A. Clear the areas to be seeded of all debris, vegetation, and other material as determined by the Engineer to be detrimental to the preparation of the seedbed. The ground surface shall be brought to the lines and grades shown on the Drawings to blend with the adjacent topography at the completion of grading. The cover soil shall be brought to a friable condition as directed by the Engineer. A disk, harrow or other implement approved by the Engineer shall be used. Assure the prepared seedbed surface is firm enough to prevent

seed loss from high winds or normal rainfall. If rolling is required, perform rolling before seeding using a suitable roller, of a weight appropriate to the soil conditions.

B. Sow seed in the areas described in these specifications and contract documents at the specified application rates.

C. Vegetative mulch shall be applied at a rate of 3,000 pounds per acre. Grass hay or straw mulch shall be anchored by a mulch tilled crimper or other device approved by the Engineer.

END OF SECTION 02910

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

This Section specifies cast-in place concrete, including formwork, reinforcing, resin anchored rock bolts, mix design, placement procedures and finishes.

1.02 RELATED SECTIONS

Section 02210 – Fill Materials and Placement Requirements
Section 02220 – Excavating

1.03 SUBMITTALS

Submit the following to ENGINEER:

A. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, and others as requested by ENGINEER.

B. Shop Drawings for reinforcement for fabrication, bending, and placement of concrete reinforcement. Comply with ACI SP-66 (88), "ACI Detailing Manual," showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

C. Laboratory test reports for concrete materials and mix design test.

D. Materials certificates in lieu of materials laboratory test reports when permitted by ENGINEER. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

E. Product Data: Manufacturer's specifications and instructions for color additives and curing compounds.

1.04 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations and elevations of embedded utilities and components which are concealed from view.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 318: Building Code Requirements for Reinforced Concrete.

2. Concrete Reinforcing Steel Institute (CRSI): Manual of Standard Practice.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Type 1 CONCRETE mix shall conform to the following specifications:

B. Portland Cement: ASTM C 150, Type II: Use one brand of cement throughout project unless otherwise acceptable to ENGINEER. See General Notes Sheet 6.

C. Fly Ash: ASTM C 618, Type C or Type F.

D. Normal Weight Aggregates: ASTM C 33. Provide aggregates from a single source for exposed concrete.

For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

Local aggregates not complying with ASTM C 33 but that special tests or actual service have shown to produce concrete of adequate strength and durability may be used when acceptable to ENGINEER.

E. Water: Potable.

F. Admixtures.

1. Provide admixtures that contain not more than 0.1 percent chloride ions.

2. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures. Use air-entraining admixture in all concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content of 5 percent with a tolerance of plus or minus 1 percent.

3. Water-Reducing and Set-Control Admixtures: Subject to acceptance by ENGINEER, provide water-reducing or set-control admixtures

complying with ASTM C 494. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions. Designate admixture types as follows:

Type A	Water-reducing admixtures.
Type B	Retarding admixtures.
Type C	Accelerating admixtures.
Type D	Water-reducing and retarding admixtures.
Type E	Water-reducing and accelerating admixtures.

Use only admixtures which have been incorporated and tested in accepted design mixes and which have been proven compatible with other components of the mix. Use in compliance with manufacturer's printed directions and recommendations.

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement of not more than 4 inches.

2.02 2.03 HARDENING, SEALING AND FINISH MATERIALS

A. General: Apply all hardening, sealing and finishing treatments in accordance with manufacturer's recommendations. Refer to the schedule below for applications.

B. Cure, Seal, Dustproofing: Use Kure-N-Seal by Sonneborne or ENGINEER-approved equal.

C. Hardener: Use Lapidolith by Sonneborne or ENGINEER-approved equal.

2.04 RELATED MATERIALS

A. Absorptive Cover: Use burlap cloth made from jute or kenaf, dry weight approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: Use one of the following, in compliance with ASTM C 171:

Waterproof paper.
Polyethylene film.
Polyethylene-coated burlap.

C. Liquid Membrane-Forming Curing Compound: Use liquid membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss shall not be more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

D. Evaporation Control: Use monomolecular film-forming compound applied

to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Eucobar," Euclid Chemical Co.
"E-Con," L&M Construction Chemicals, Inc.
"Confilm," Master Builders, Inc.

E. Bonding Compound: Acrylic or styrene butadiene.

Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Acrylic Bondcrete," The Burke Co.
"Day-Chem Ad Bond," Dayton Superior Corp.
"SBR Latex," Euclid Chemical Co.
"Daraweld C," W.R. Grace & Co.
"Hornweld," A.C. Horn, Inc.
"Everbond," L & M Construction Chemicals, Inc.
"Acryl-Set," Master Builders Inc.
"Intralok," W.R. Meadows, Inc.
"Sonocrete," Sonneborn-Rexnord.

F. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material "Type," "Grade," and "Class" to suit project requirements.

Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Burke Epoxy M.V.," The Burke Co.
"Euco Epoxy System #452 or #620," Euclid Chemical Co.
"Epoxtite Binder 2390," A.C. Horn, Inc.
"Epabond," L&M Construction Chemicals, Inc.
"Concresive 1001," Master Builders, Inc.
"Sikadur 32 Hi-Mod," Sika Corp.

2.05 FORM MATERIALS

A. Forms for Exposed Finish Concrete:

1. Use plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings.

2. Plywood shall comply with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D. Form Ties:

1. Use factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal.

2. Provide units that will leave no metal closer than 1-1/2 inches to exposed surface. Provide ties that, when removed, will leave holes not larger than 1-inch diameter in concrete surface.

2.06 REINFORCING MATERIALS

If the construction requires cold joints in the vertical portion of the structure (not between the apron and the vertical wall) at the cold joint, the reinforcement shall be galvanized or epoxy coated.

A. Reinforcing Bars: ASTM A 615, Grade 60 for No. 5 and greater rebar and Grade 40 for No. 4 rebar and less, deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar-type supports complying with CRSI specifications.

2.07 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to ENGINEER for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

B. Limit use of fly ash to not exceed 25 percent of cement content by weight.

C. Submit written reports to ENGINEER of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been approved by ENGINEER.

D. Design mixes to provide normal weight concrete with the following properties:

Type A: 4000-psi 28-day compressive strength; 611 pounds cement per cubic yard minimum with a maximum water/cement ratio of 0.45.

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by ENGINEER. Laboratory test data for revised mix design and strength results must be submitted to and accepted by ENGINEER before using in work.

2.08 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C 94.

When air temperature is between 85° F (30° C) and 90° F (32° C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90° F (32° C), reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, chamfers, blocking, screens, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

D. Where interior area of formwork is inaccessible for cleanout, provide temporary openings for inspection before concrete placement. Locate temporary openings in forms at inconspicuous locations. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar.

E. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by ENGINEER.

D. Place reinforcement to obtain the specified coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

3.03 JOINTS

A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to ENGINEER.

B. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and elsewhere as indicated on Drawings.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated.

3.04 PREPARATION OF FORM SURFACES

A. Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before reinforcement is placed. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

B. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces or reinforcing steel against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.05 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete installation of formwork, reinforcing steel, and items to be embedded or cast in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.

B. Comply with ACI 304, "Recommended Practice for Assuring, Mixing, Transporting, and Placing Concrete."

C. Placing Concrete in Forms: Deposit concrete continuously or in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints. If a section cannot be placed continuously, provide construction joints as specified herein. Deposit concrete to avoid segregation at its final location.

D. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

E. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer

and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

F. Cold-Weather Placing: Comply with provisions of ACI 306 and as follows:

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

2. Do not use frozen materials or materials containing ice or snow.

3. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

4. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

G. Hot-Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and the following:

1. Cool reinforcing steel so steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

2. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

3. Upon prior approval by ENGINEER, use water-reducing retarding admixture as needed due to high temperatures, low humidity, or other adverse placing conditions.

3.06 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. The concrete surface will have texture imparted by form-facing material used, with tie holes and defective areas repaired and patched. Fins and other projections exceeding 1/4 inch in height shall be rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed to view. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

C. Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.07 CONCRETE CURING AND PROTECTION

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screening and bull floating, but before power floating and troweling.

B. After placing and finishing, start initial curing as soon as free water has disappeared from concrete surface. Weather permitting, keep continuously moist for not less than 7 days.

C. Curing Methods: Perform curing of concrete by moist curing, moisture-retaining cover curing, or combinations thereof as specified below.

1. Moist Curing: Use a continuous water-fog spray to keep the concrete surface continuously wet.

2. Moisture-Retaining Cover: Cover concrete surfaces with specified moisture-retaining cover placed in the widest practicable width, with sides and ends lapped at least 4 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape. Thoroughly saturate cover with water, and keep continuously wet for the duration of the specified curing period.

D. Structure wall shall cure for a minimum of 3 days prior to backfilling. Backfilling of structure wall shall be conducted in two stages.

1. Backfilling of structure wall in preparation of apron subgrade shall be conducted to avoid unbalanced stresses against the structure wall. Contractor shall backfill both sides (upstream and downstream) up to the apron subgrade elevation concurrently in order to minimize the potential for unbalanced stresses.

2. Backfilling of the upstream side of structure shall be conducted after the apron slab has met the minimum cure period.

D. Apron shall cure for a minimum of 2 days prior to receiving stream flows.

3.08 REMOVAL OF FORMS

Formwork not supporting weight of concrete, such as sides of walls and similar parts of the work, may be removed after curing at not less than 50° F (10° C) for 24 hours, provided concrete is sufficiently hard to not be damaged by form removal operations. Curing and protection operations as specified herein shall be maintained during and after form removal.

3.09 REUSE OF FORMS

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and latence, and tighten forms to close joints. Align and secure joint to avoid offsets. The use of "patched" forms for exposed concrete surfaces must be approved by ENGINEER.

3.10 CONCRETE SURFACE REPAIRS

A. Perform structural repairs with prior approval of ENGINEER for method and procedure, using specified epoxy adhesive and mortar.

B. Immediately after removal of forms, repair and patch defective areas, as determined by ENGINEER, with cement mortar. Cut out cracks, spalls, popouts, air bubbles, fins, honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, and other defective areas, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried, or as specified in the manufacturer's printed instructions for the bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete. Repair and finish concrete surfaces as follows:

1. Repair of Unformed Surfaces: Test unformed surfaces for smoothness and verify compliance with surface tolerances specified herein. Repair unformed surfaces that contain defects affecting durability, including crazing and cracks in excess of 0.01 inch wide or any cracks that penetrate to reinforcement or completely through nonreinforced sections regardless of width. Perform specific types of

repairs as follows:

a) Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

b) Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to ENGINEER.

c) Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

2. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair methods not specified above may be used, subject to acceptance of ENGINEER.

3.11 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: Contractor shall conduct sampling and testing for quality control during placement of concrete. Testing shall be conducted by an ACI certified concrete technician. Results of the testing shall be submitted to the Engineer. Testing shall include the following:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump: ASTM C 143. Conduct test every day of placement for every 25 cy and more frequently if batching appears inconsistent. Conduct with strength tests.

3. Air Content: ASTM C 231 pressure method. Conduct with slump test.

4. Concrete Temperature. Conduct with slump tests.

5. Compression Test Specimen: ASTM C 31. One set of 4 cylinders per day and every 100 cy for each class of structural concrete.

6. Compressive Strength Tests: ASTM C 31. Test one cylinder at 3 days and two at 28 days. One field cure cylinder test shall be made when insitu strengths are required to be known. One cylinder shall be used as a duplicate.

7. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

8. Additional Tests: When test results indicate specified concrete strengths and other characteristics do not conform with those specified herein, ENGINEER may require additional tests of in-place concrete. The Contractor shall pay for such additional tests. Additional tests may include tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42.

END OF SECTION 03300

SECTION 05120

MISCELLANEOUS METALS

PART 1 GENERAL

1.01 SECTION INCLUDES

This Section includes miscellaneous steel work, and miscellaneous metal fabrications, as shown on Drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.

1.02 RELATED SECTIONS

Section 02220 – Trench Excavation and Backfilling
Section 02620 - Corrugated Metal Pipes and Outlet Works

1.03 SUBMITTALS

A. Shop drawings including complete details and schedules for fabrication and assembly of steel members, procedures, and diagrams.

1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.

1.04 REFERENCES

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."

2. AISC "Specifications for Structural Steel Buildings," including "Commentary."

3. "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.

4. American Welding Society (AWS) D1.1 "Structural Welding Code -

Steel."

5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

1.05 QUALIFICATIONS

A. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

PART 2 PRODUCTS

2.01 MATERIALS

A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.

B. Structural Steel Shapes, Plates, and Bars: ASTM A 36.

C. Steel Pipe: ASTM A 53, Type E or S, Grade B; or ASTM A 501.

D. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

E. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A 325.

F. Provide units that are zinc coated, either mechanically deposited complying with ASTM B 695, Class 50, or hot-dip galvanized complying with ASTM A-153.

G. Electrodes for Welding: Comply with AWS Code.

H. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.

I. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds or repairs to galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

PART 3 EXECUTION

3.01 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble steel assemblies in shop. Fabricate items all in accordance with AISC Specifications and as indicated on final shop drawings. Complete assembly, including welding of units, before start of galvanizing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

1. Connections: Weld or bolt shop connections, as indicated.

   a. Bolt field connections, except where welded connections or other connections are indicated.

   b. Provide high-strength threaded fasteners for all bolted connections.

2. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."

3. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

   Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.

4. Holes for Other Work: Provide holes required for securing other work to steel assemblies and framing as shown on final shop drawings.

   Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

3.02 GALVANIZED FINISH

A. General: Hot-dip galvanize all structural and miscellaneous steel members and assemblies except where otherwise indicated. Comply with ASTM A 123 for galvanizing steel products made from rolled, pressed, and forged steel shapes, castings, plates, bars and strips. Comply with ASTM A 153 for galvanizing iron and steel hardware.

1. Hot-dip galvanize all items except bolted assemblies after fabrication. Galvanizing shall be performed after fabrication into the largest practicable sections. All welding flux shall be removed before galvanizing. Components of bolted assemblies shall be galvanized separately before assembly.

2. Galvanizing shall be free from general roughness, dross pimples, blisters, and wet storage stain.

3.03 SOURCE QUALITY CONTROL

A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

Promptly remove and replace materials or fabricated components that do not comply.

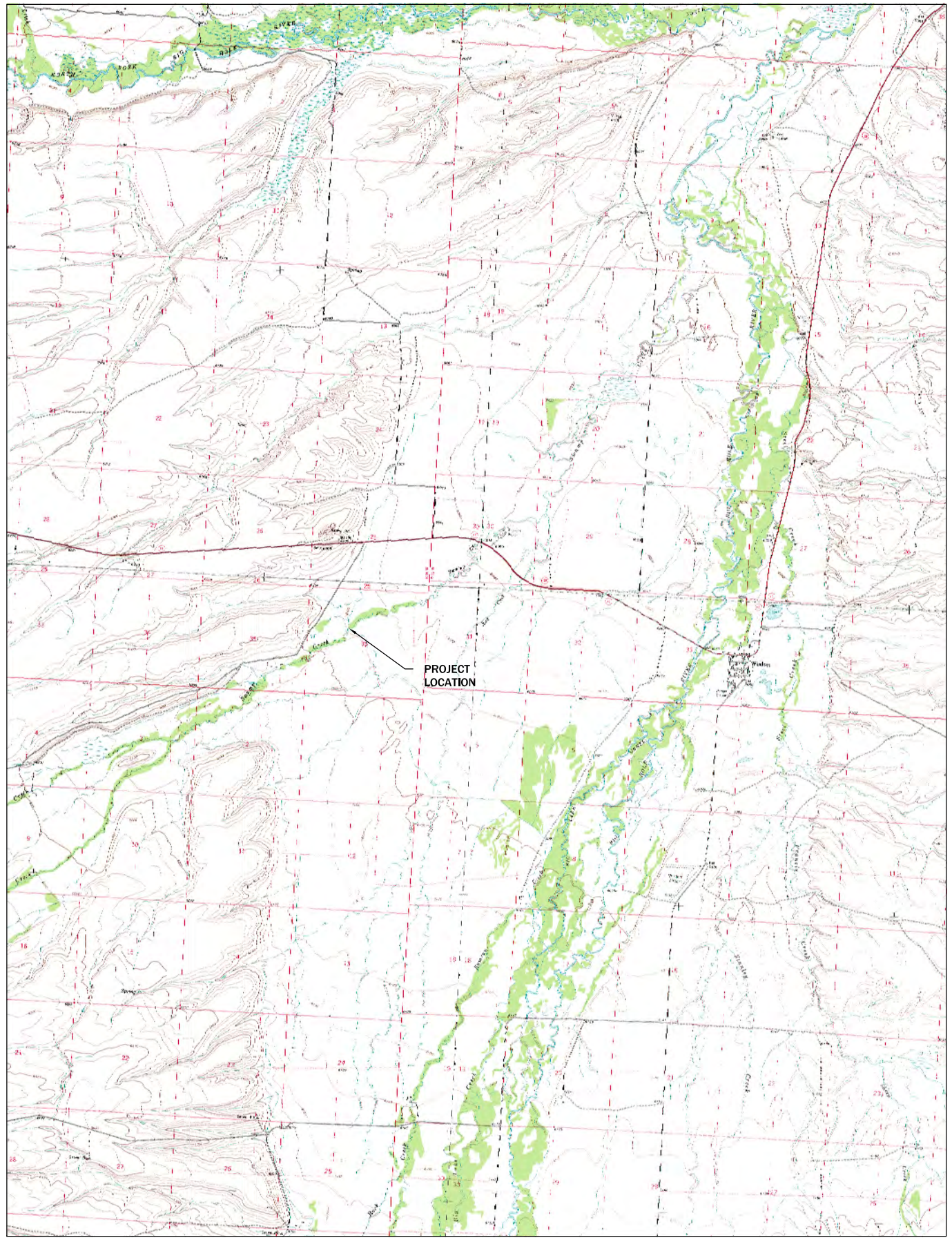
B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

Promptly notify Engineer whenever design of members and connections for any portion of structure are not clearly indicated.

END OF SECTION

APPENDIX A

Drawings



SITE VICINITY MAP
SECTION 36, T25, R16W

SPOKANE SIPHON FISHERIES ENHANCEMENT PROJECT

PREPARED FOR

FWP #12-23
WISDOM, MT.

DRAFT
NOT FOR CONSTRUCTION

PREPARED BY

PIONEER
TECHNICAL SERVICES, INC.

MARCH 21, 2012

SHEET
1-1

LEGEND

6550 — EXISTING INDEX CONTOURS

EXISTING INTERMEDIATE CONTOURS

DRAINAGE

STREAM

EXISTING TEXT

PROPOSED TEXT

PROPERTY LINE

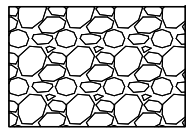
PROPOSED INDEX CONTOURS

PROPOSED INTERMEDIATE CONTOURS

WETLAND BOUNDARY

0+50 1+00 1+50 — CENTERLINE

3 / 1 — SLOPE DESIGNATION



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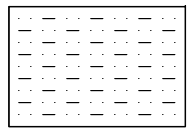
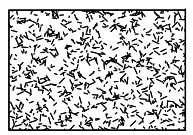
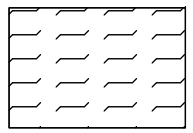


VEGETATIVE BACKFILL

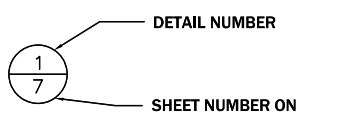


GENERAL FILL



NON-DEFORMABLE STREAM CHANNEL

DETAIL INDICATOR

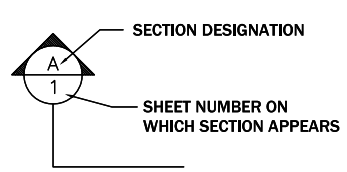


ON PLAN

DETAIL 1/7 — DETAIL NUMBER; SHEET NUMBER ON WHICH DETAIL APPEARS.

AT DETAIL

SECTION INDICATOR



ON PLAN

SECTION A—A / 7 — SECTION DESIGNATION; SHEET NUMBER ON WHICH SECTION APPEARS.

AT SECTION DETAIL

SHEET INDEX

GENERAL NOTES

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DESIGNED BY: XX
CHECKED BY: XX
APPROVED BY: XX
PROJECT NO: 16822
DATE: 5-21-12

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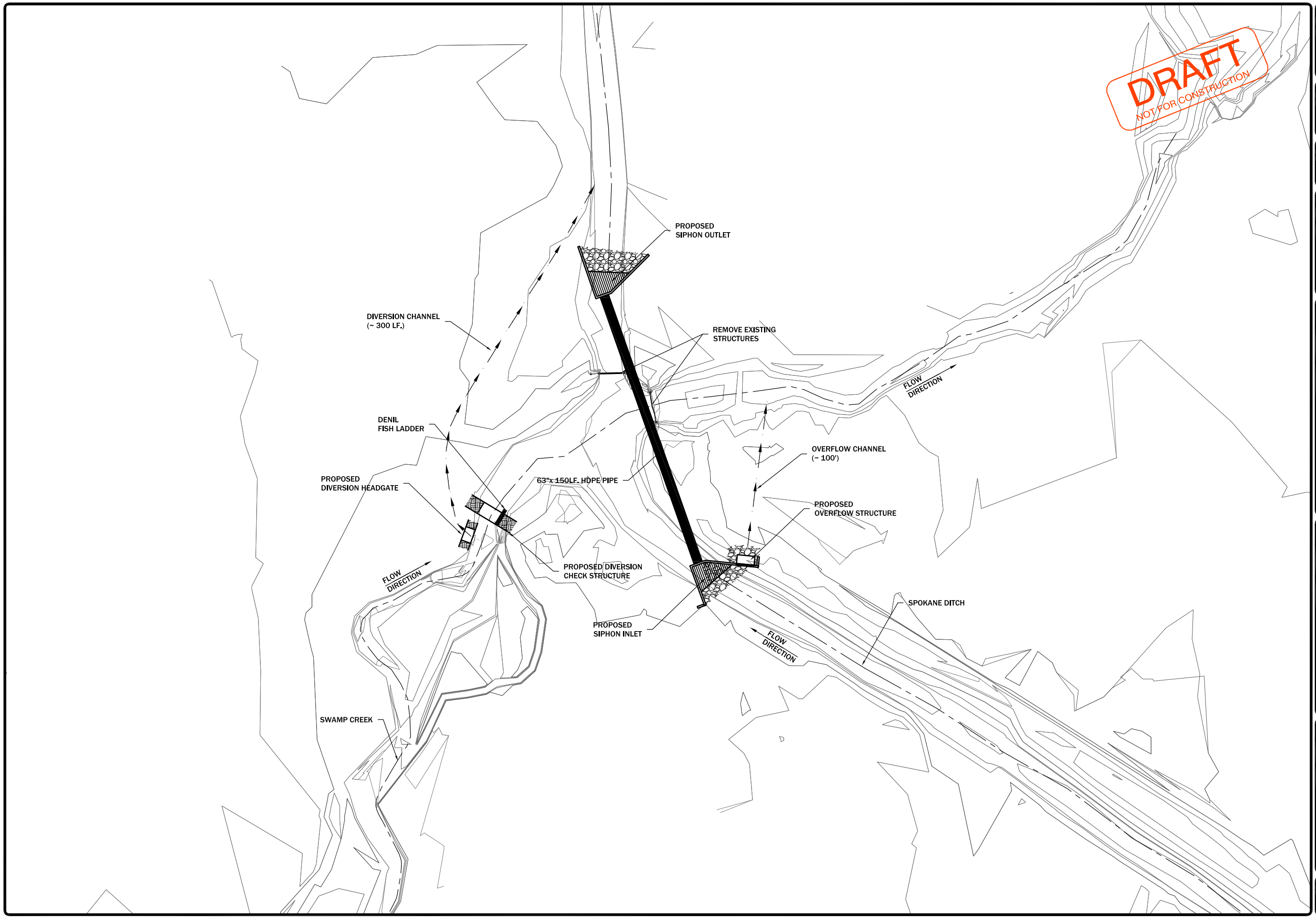
WISDOM, MT.
FPW.

LEGEND AND SHEET INDEX

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

SHEET 1-2



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SOURCE: PIONEER

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16822

PLAN VIEW
SPOKANE SIPHON

PIONEER
TECHNICAL SERVICES, INC.
201 EAST BROADWAY
HELENA, MONTANA 59601
(406) 457-8252

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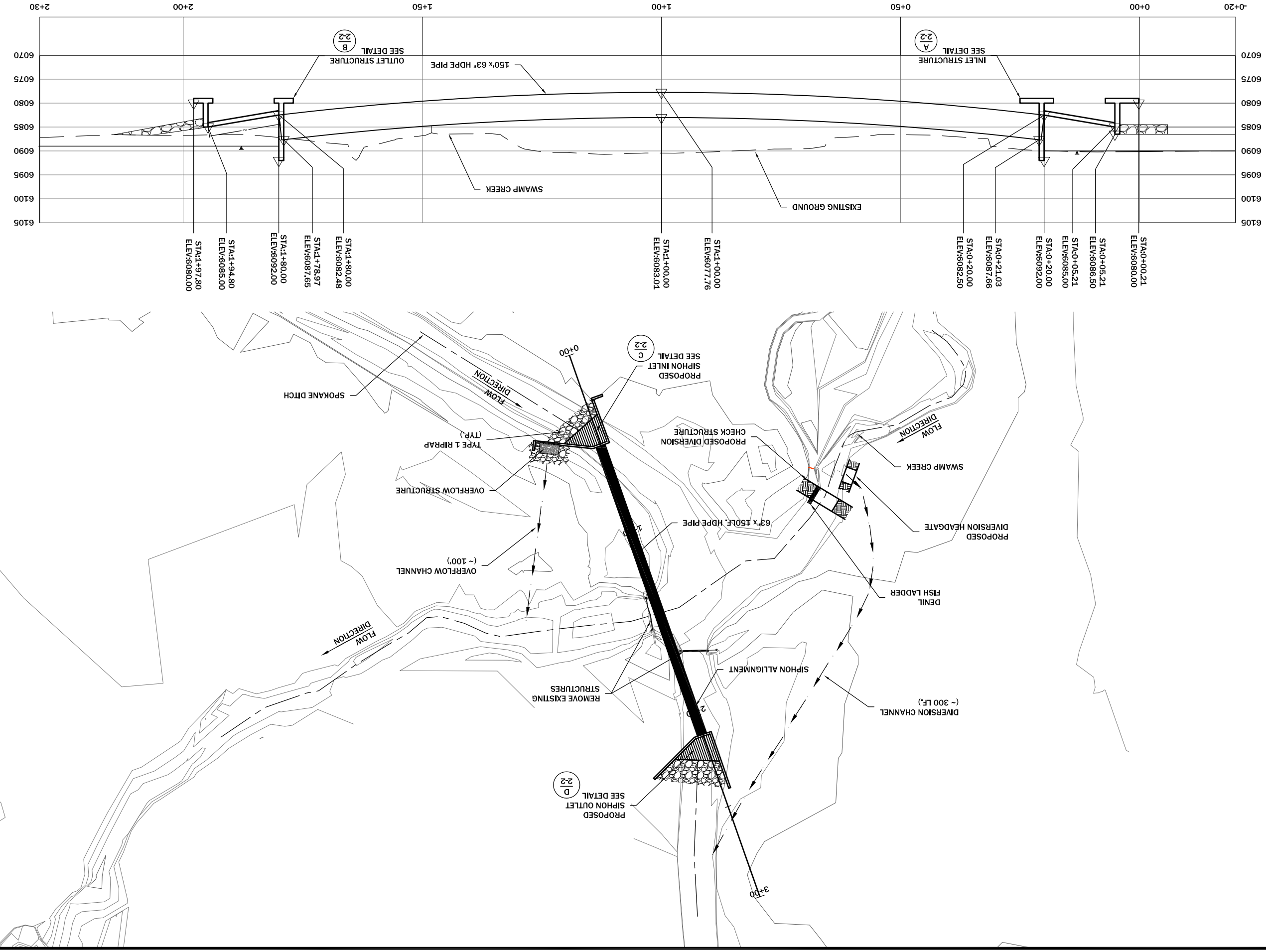

SHEET 2-1

PIONEER TECHNICAL SERVICES, INC.
201 EAST BROADWAY
HELENA, MONTANA 59601
(406) 457-8252

PLAN & PROFILE SPOKANE SIPHON

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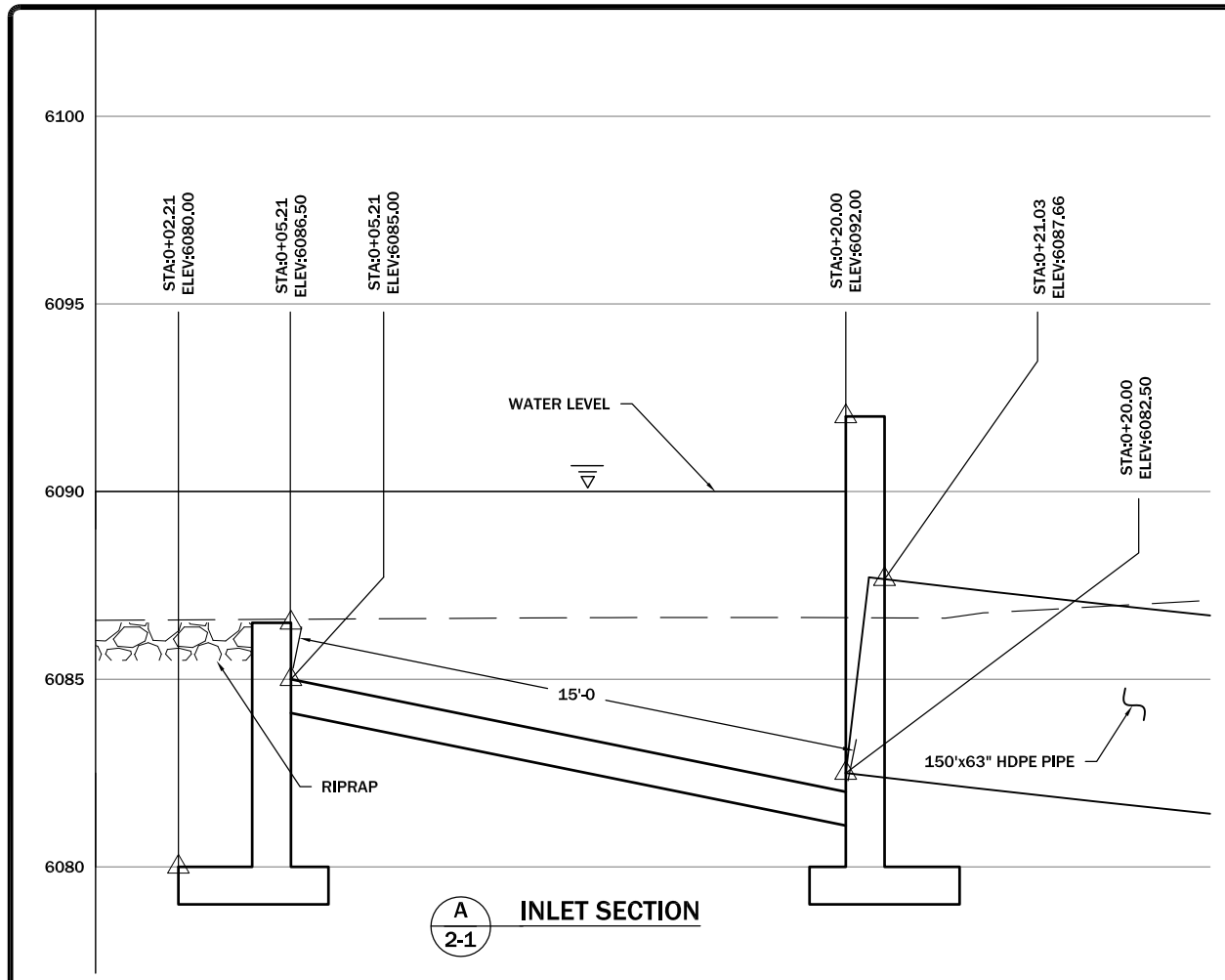

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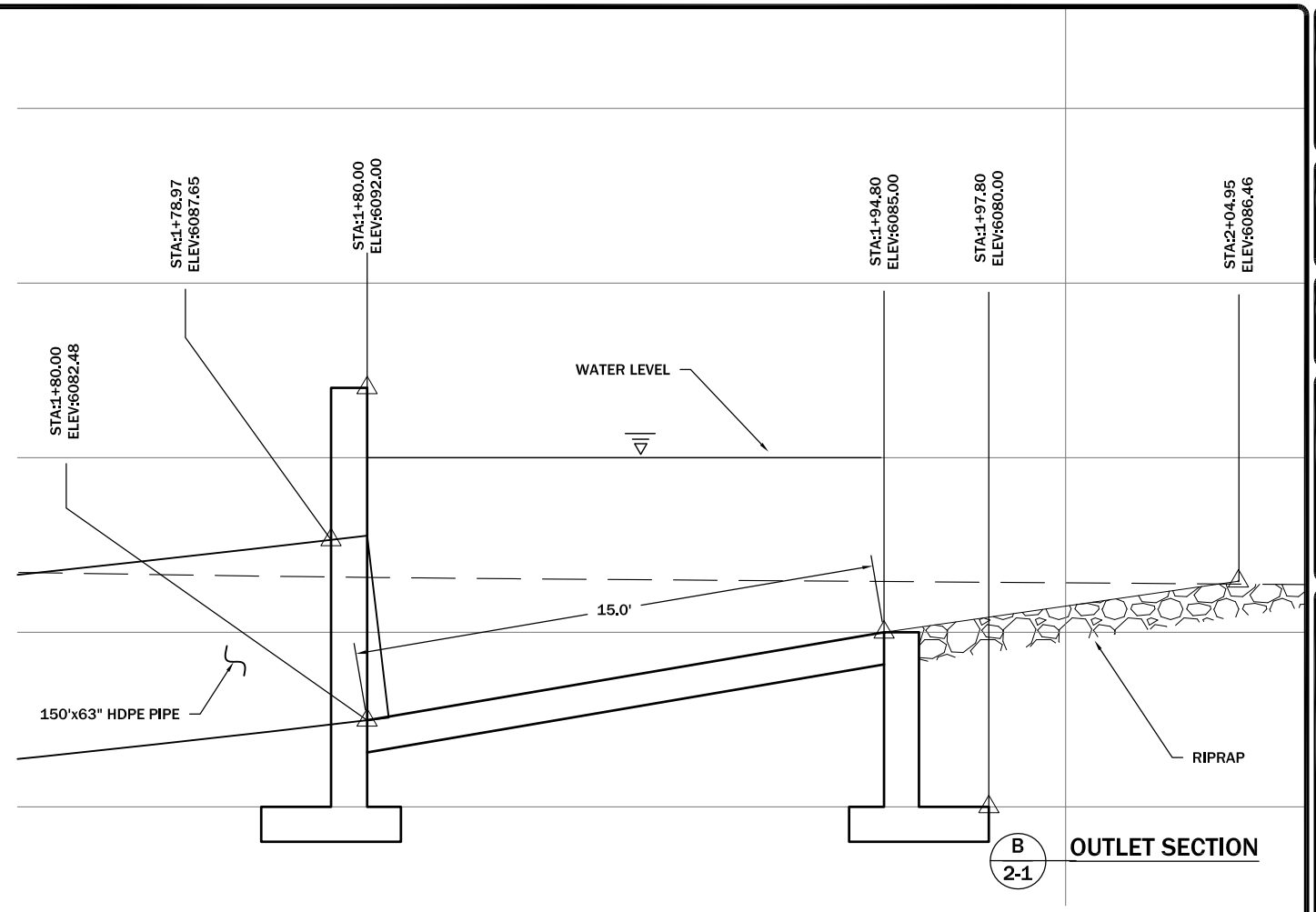

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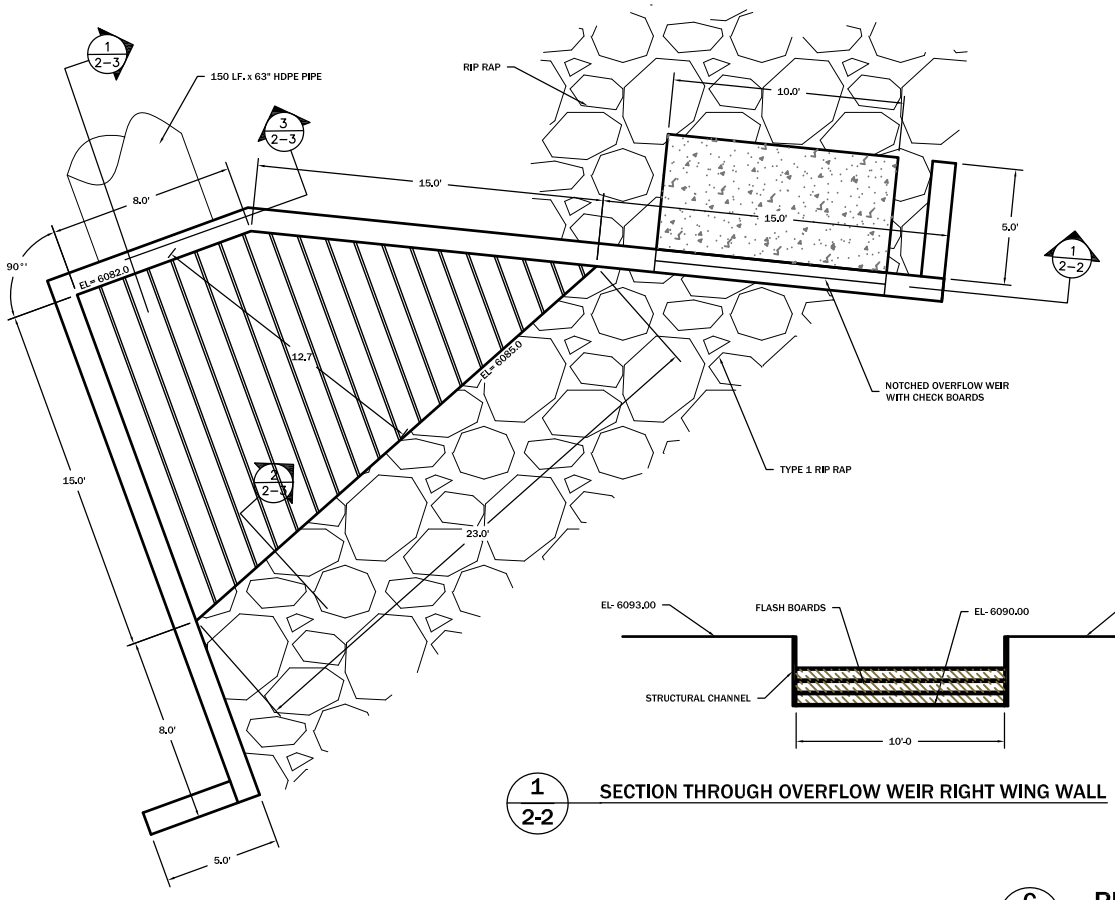

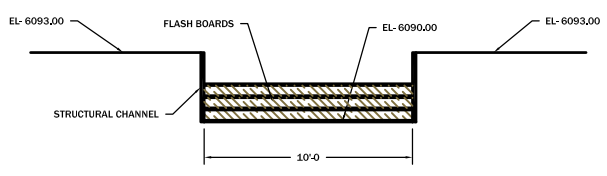

1 2-2 **SECTION THROUGH OVERFLOW WEIR RIGHT WING WALL**

C 2-1 **PLAN VIEW INLET**
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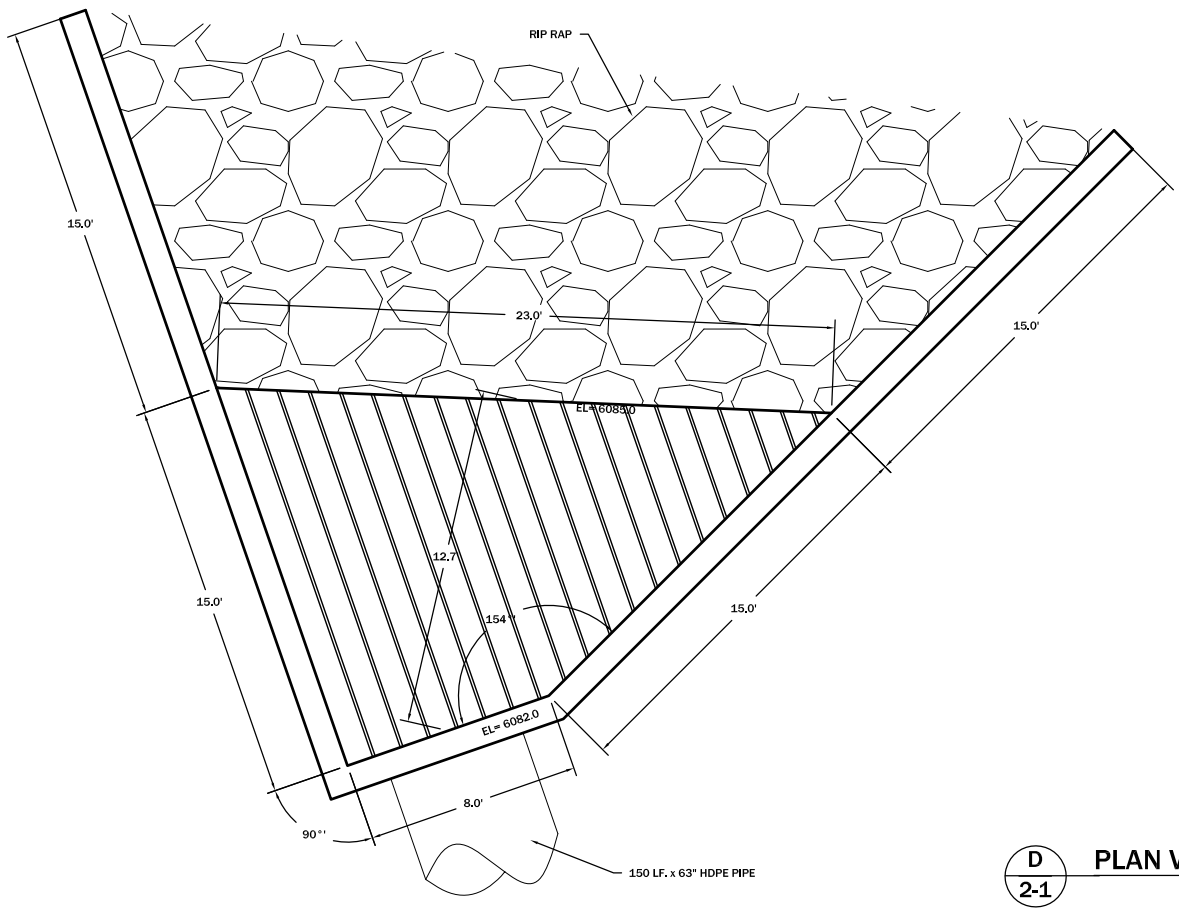

D 2-1 **PLAN VIEW OUTLET**
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PROJECT NO: 16822
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16822

DETAILS
SPOKANE SIPHON

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201 EAST BROADWAY
HELENA, MONTANA 59601
(406) 457-8252

SHEET
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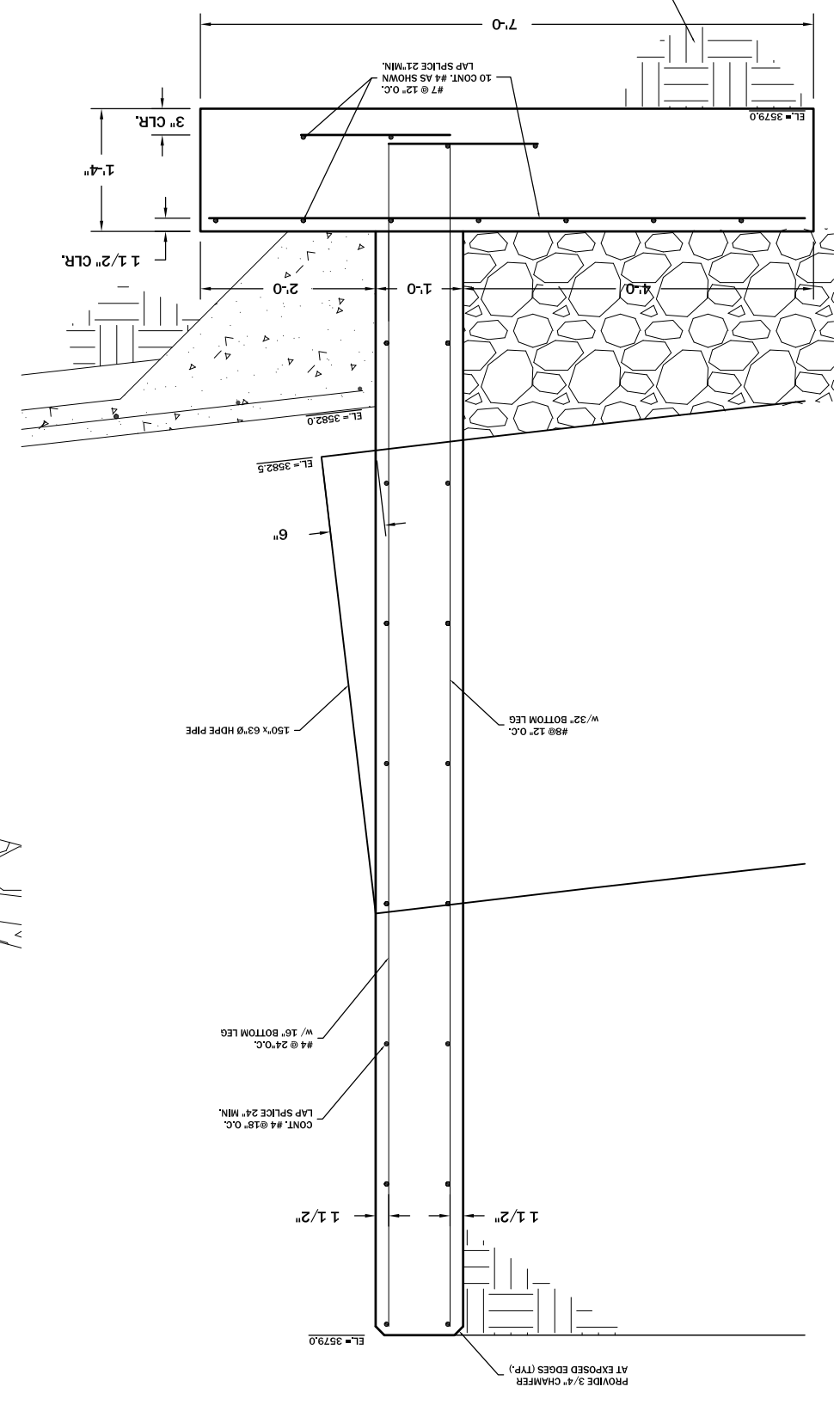

1 2-2 **WINGWALL TYPICAL SECTION**
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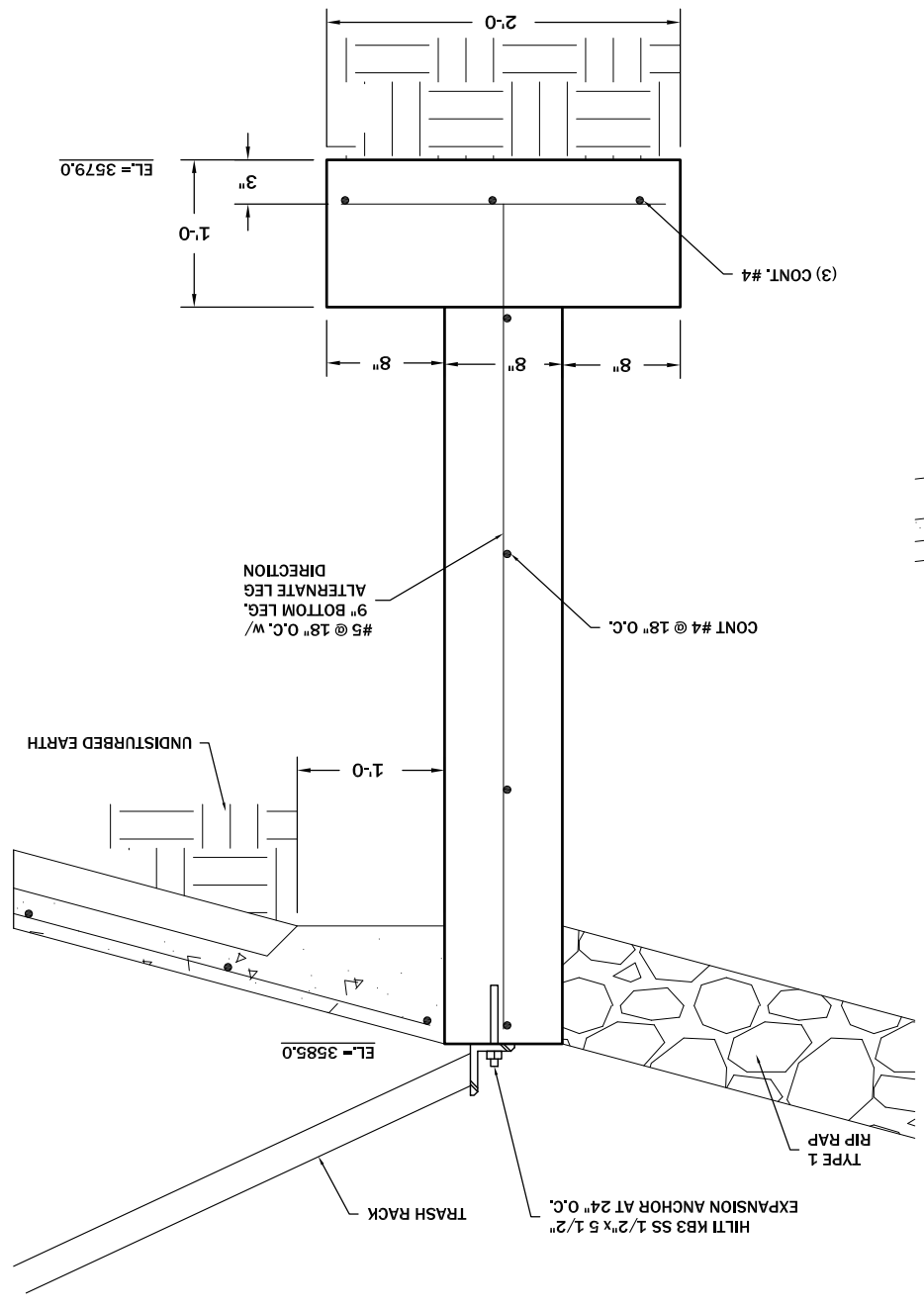

2 2-2 **CROSS WALL TYPICAL SECTION**
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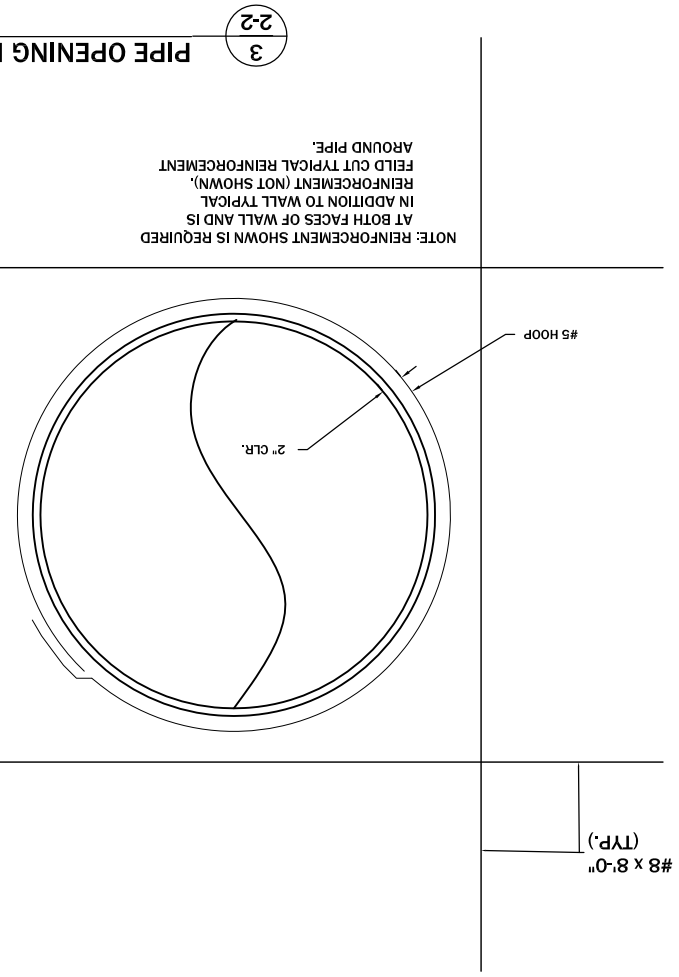


NOTE: REINFORCEMENT SHOWN IS REQUIRED AT BOTH FACES OF WALL AND IS IN ADDITION TO WALL TYPICAL REINFORCEMENT (NOT SHOWN). FIELD CUT TYPICAL REINFORCEMENT AROUND PIPE.

3 2-2 **PIPE OPENING REINFORCEMENT**
N.T.S.

SHEET 2-3

PIONEER
TECHNICAL SERVICES, INC.
201 EAST BROADWAY
HELENA, MONTANA 59601
(406) 457-8252

DETAILS
SPOKANE SIPHON

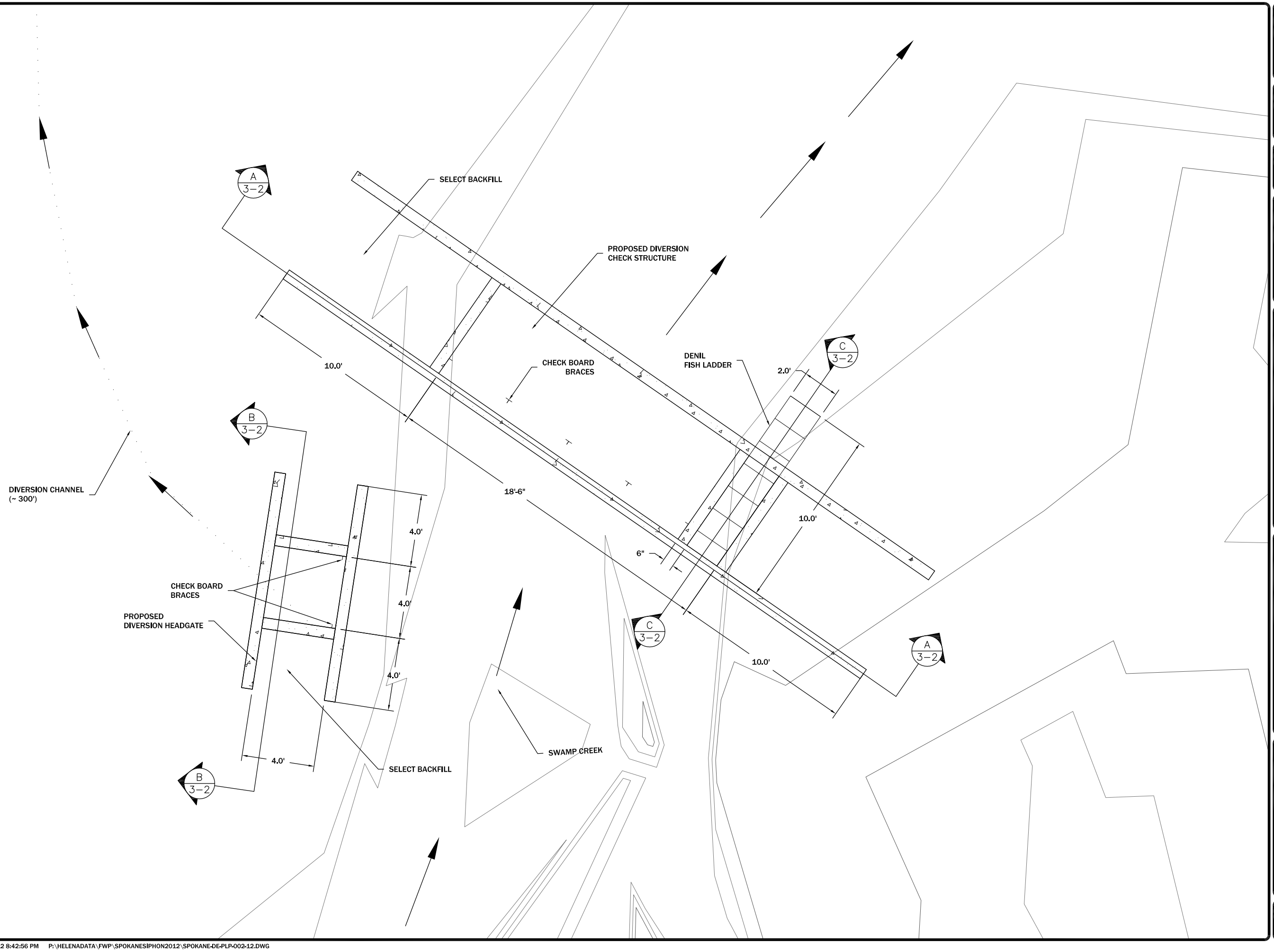
MFPW
WISDOM, MT.
16822

SCALE IN FEET
0 NTS.

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD83
UNITS: FT.
SOURCE: PIONEER

DRAWN BY: ECO
DESIGNED BY:
CHECKED BY:
APPROVED BY:
PROJECT NO.: 16822
DATE: 5-21-12

REVISION:
DATE: BY: DESC:



REVISION:

DATE:	BY:	DESC:

DRAWN BY: ECO
DESIGNED BY:
CHECKED BY:
APPROVED BY:
PROJECT NO: 16822
DATE: 5-21-12

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD83
UNITS: INT. FEET
SOURCE: PIONEER

SCALE IN FEET
0 2.5 5

MFWP
WISDOM, MT.
16822

PLAN VIEW
DIVERSION HEADGATE
DIVERSION CHECK STRUCTURE
DIVERSION

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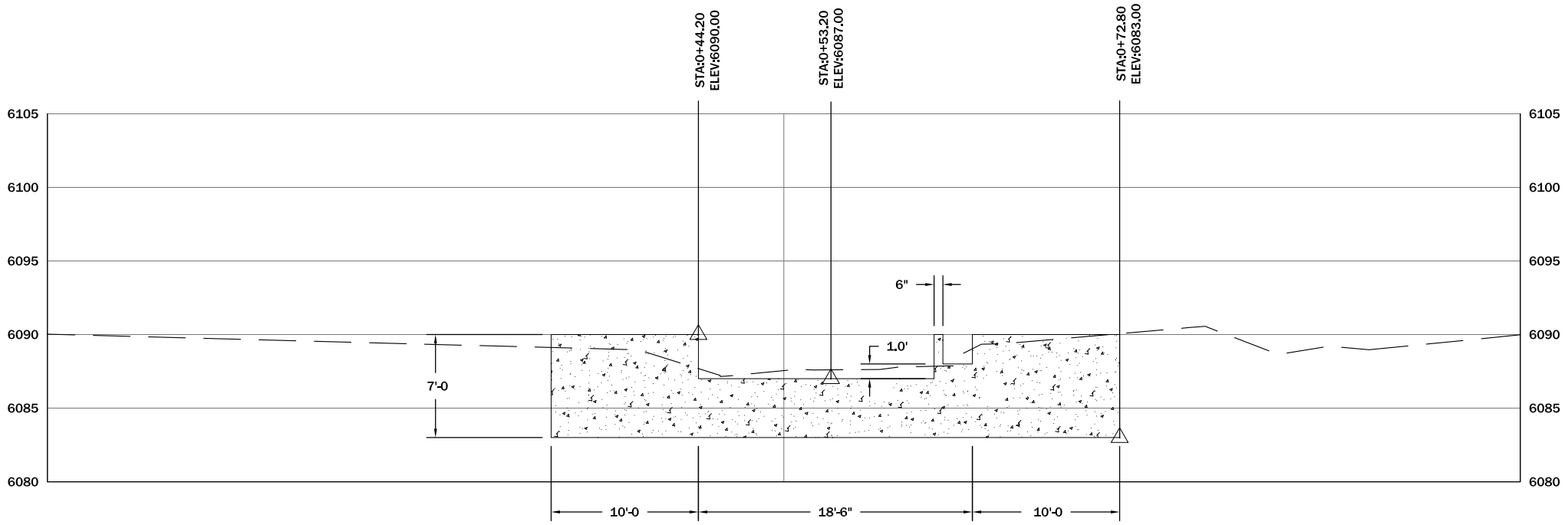
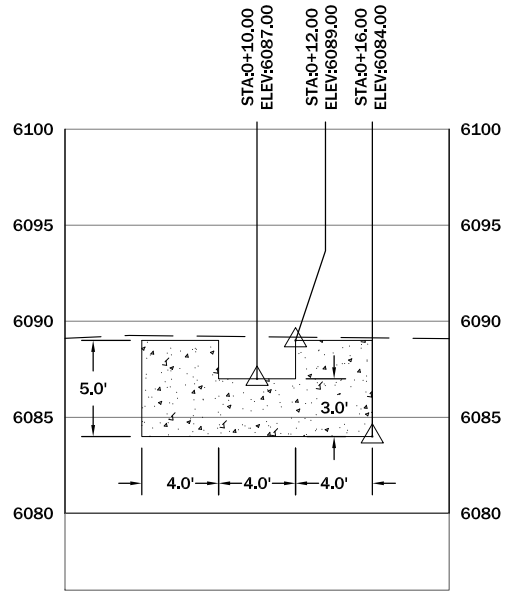
201 EAST BROADWAY
HELENA, MONTANA 59601
(406) 457-8252

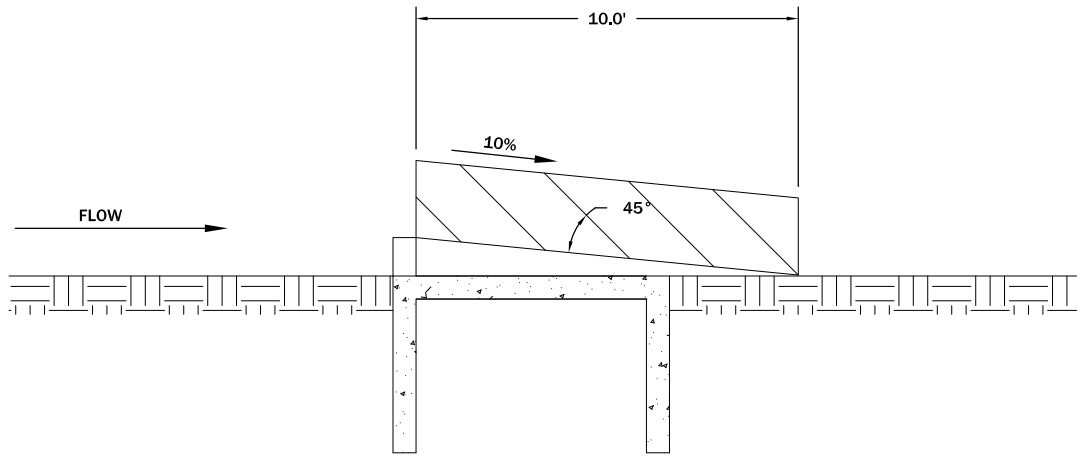
SHEET
3-1



A 3–1 **DIVERSION CHECK STRUCTURE**



B 3–1 **DIVERSION HEADGATE**



C 3–1 **FISH LADDER PROFILE**

REVISION:
DATE: BY: DESC:

DRAWN BY: ECO
DESIGNED BY:
CHECKED BY:
APPROVED BY:
PROJECT NO: 16822
DATE: 5-21-12

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD83
UNITS: INT. FEET
SOURCE: PIONEER

SCALE IN FEET
0 5 10

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WISDOM, MT.
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DETAILS
DIVERSION HEADGATE
DIVERSION CHECK STRUCTURE

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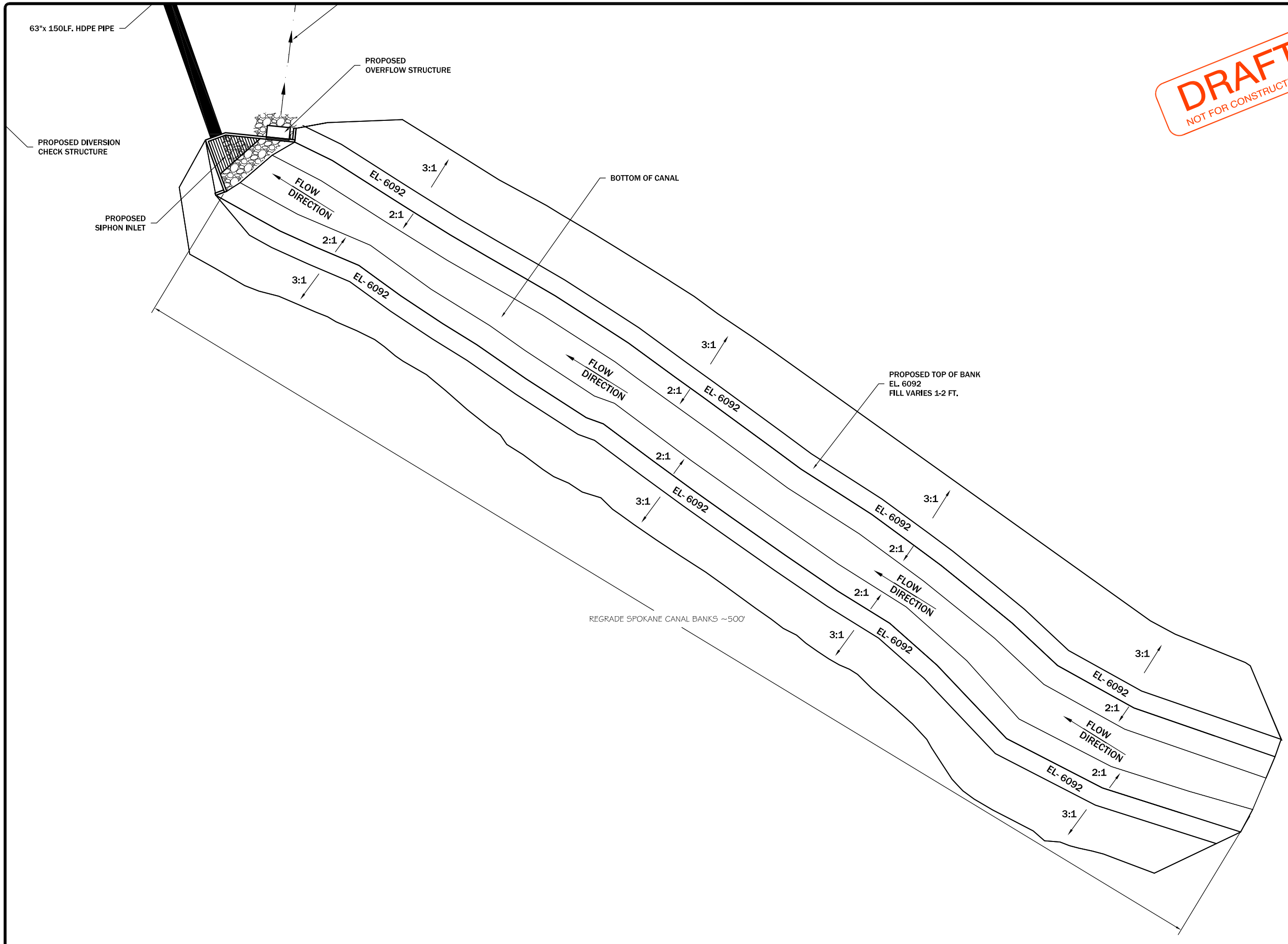
(406) 457-8252

SHEET
3-2



DRAFT
NOT FOR CONSTRUCTION

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DRAWN BY: ECO
DESIGNED BY:
CHECKED BY:
APPROVED BY:
PROJECT NO: 16822
DATE: 5-21-12

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD83
UNITS: INT. FEET
SOURCE: PIONEER

SCALE IN FEET
0 20 40

MFWP
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16822

BACKFILL PLAN
REGRADING SPOKANE
CANAL BANKS

PIONEER
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201 EAST BROADWAY
HELENA, MONTANA 59601
(406) 457-8252

SHEET
4-1